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Training for the Supervisor's Job In Industry

R. V. Rickcord, Supervisor of Training, the Edison Industries, Orange, N. J.

IT has been stated that education has for one of its objects the production "of the fittest reactions in any circumstances of life" and that "the purpose of education is to make them (the reactions), numerous and perfect." This definition can be said to apply to industrial education. *Industrial education has for its object the production of the fittest reactions in any circumstances of industrial life, reactions whereby the difficulties and problems arising in industry will be most suitably cared for.*

The definition applies to both actual producer and supervisor. Circumstances are eternally arising for both of them relating not only to the actual doing of the jobs, but to the relations between man and man, and to outside happenings and national or world movements, which absolutely call for a definite and most suitable set of reactions under the circumstances.

The education of all people in industry is then to produce certain suitable reactions. The consideration of any problem implies the existence of a difficulty which has not been experienced before. In this respect education does not presume to know the end of things. If it did, a suitable set of reactions could be engineered and the desired end easily be brought about in every circumstance of life. The prophetic viewpoint is not a part of education. It aims rather at creating a series of experiences, mental and physical, which at the introduction of new problems, produce reactions along certain definite lines whereby solutions are arrived at in conformity with the correct ethics.

Certain individual units of instruction call for the utilization of expert advice. An expert in hiring of men explains his methods to the group. This enables him to obtain in advance the co-operation of the men whose services sometime in the future will probably be used in a supervisory capacity.

The mistake should not be made that the operator requires less education along these lines than the supervisor. In many respects he needs more, since most improvements can be carried out to their maximum capacity only with his full willingness and co-

operation; and his willingness, other things being equal, will be in proportion to the extent to which he understands both the improvements and the aim to be arrived at. In a way the culminating point of all industrial education, be it given to the supervisor or not, is the worker; since it is upon him that the concern depends for the carrying out of the object of its existence. In other words, the ultimate instrument of execution should be so thoroly fitted up with the three categories of instructions mentioned in the first part of this article, his job, his personal relations, and his community responsibility, that he will, of his own accord, produce with the maximum possible efficiency. One's efforts should be concentrated on creating the desire whereby the operator will adopt and bring about improvements and additions himself, that is, subjectively, rather than to depend upon the objective method of forcing improvements from the top.

In the writer's experience, the finest personal relations and confidence have existed between employers and employes in those somewhat smaller concerns where the president or some other high official of the company has taken upon himself, in the midst of the pressure of business, to give of his experience and knowledge of the business, a few personal hints to an operator here and there; a request to attend a night school to some minor foreman, with an explanation of the reason why; some personal experience given to the chief fireman, culled from the days when he himself watched the consumption of every ton of coal. The value of such contact consisted in the accuracy and exactness of such instruction that was given, due to the experience and knowledge of conditions behind it, and in the sacrifice on the part of the head of the concern in making such occasional contact.

It is not too much to ask that any general educational course for supervisors should have for its purpose the filling of the gap which the removal of such contact creates, and all instruction should be given with the idea that it will seep through and visibly relate to the actual producer through contact between the such supervisor and producer. On the other hand, the gap cannot be altogether filled by training. Nothing can entirely make up for the absence of contact with the "big chief." This desire for this contact is a basic human instinct, and no mechanical counterfeit can make up for it. The lack of something due to absentee directorate is nearly absolute. "Representation industry" is parallel but does not replace it. Therefore, contact between supervisor and actual producer can only make up for that which is supplied by contact with the chief executive in a minor degree. As a corollary the supervisor will satisfy the worker and create confidence in proportion as he creates the feeling of contact between actual producer and directorate.

Complete understanding as to the aims of a course of instruction is really the starting point of all good teaching. It should be borne in mind that it is impossible for the instructor to teach the student anything, even in the smallest degree. The student must teach himself. All that the instructor can do is to bring the student to the state of mind where he desires to learn. In other words, to create in the student the desire to work the physical and mental machinery *within himself* so that the idea may be suitably and properly absorbed into his equipment and used when the time is ripe and when the opportunity presents itself. The creation of this willingness is the crux of the whole question and applies equally to the instruction and the use to which the instruction is put after it has been absorbed into the system. A savory meal will be eaten by an individual only when he has an appetite for it. The student has on one hand his job and on the other hand a knowledge of certain new methods which he has absorbed into himself in the course of instruction. The willingness to bring them together lies entirely with the student. If the instruction has been good so that all outstanding difficulties have been discussed and misunderstandings eliminated, the state of mind is easily reached wherein the two can be brought together. And this is the commencement of the realm where kinds of improvements stop which have been forced on from the exterior by efficiency engineers, time-study men, itinerary-speed specialists and what not. The extent to which the realm of willingness and cooperation is traversed will depend on the state of mind which the instructor is able to produce within the students.

In the discussion which follows, it is presumed that the supervisor knows his trade as a craftsman or practical producer in his department as well as the trade mathematics and science related to his work. Bearing in mind the facts that the primal object of instructional work for supervisors is the creation of a certain state of mind, in order that new and efficient methods may be installed and brought about to an extent not possible by mere exterior studies and orders-in-council, the work of instructing supervisors may, for the purpose of mutual understanding, be put up under three headings in order of importance. The aims of the course are:

Educational (in the sense defined in the early part of this article) and broadening.

Appreciation of the chief's problem, and therefore the creation of a natural desire to solve them.

More thoro and systematical doing of the job on hand, as a result of the analysis of details which are bound to come up in the course.

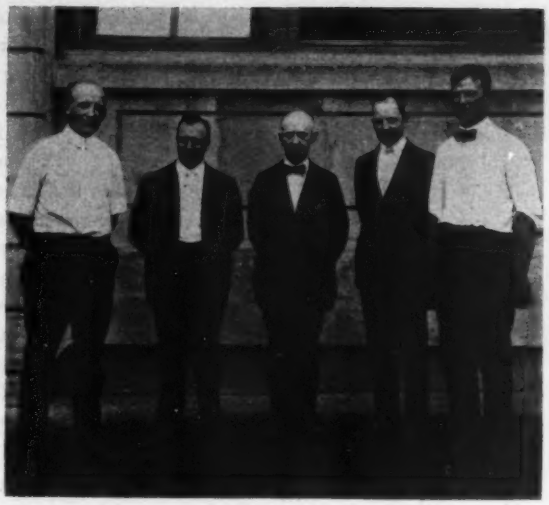
Observe, there is no *apparent* immediate contact between the aims of the instruction and the job. There is no idea of teaching certain methods of production, in order that they may be *immediately* installed, there is no expecting that the student will on his return to his job immediately "systematize" his department. Rather, a gradual evolution is expected as opportunities present themselves, and as a result of the student

being primed, the introduction of a greater willingness on his part to sooner or later, and in a manner that is silent, quick, complete, make a new contact between the old job and the new method.

This method of working out improvements is often not only desirable but necessary in view of departmental organization, or perhaps because of the fact that the student may be of the minor executive type and therefore not in a position to carry out immediate reforms except thru the medium of quiet suggestion and working diplomatically along with his chief. As a matter of fact educational work among the members of the departmental supervisory force is a larger undertaking than it appears to be at first sight. It includes the establishment of those conditions to permit supervisors to make the wide lateral movements which will be necessary to permit them to undertake a course of instruction.

In plain language it calls for the establishment of assistants so that supervisors can leave the departments when they like and to the extent they like, without making any difference to the production of the department. This has long been conceded to be good business, the theory being that if it can be done, the supervisor can take his mind entirely off the routine things of his department and concentrate on those new things which make for improvements. In practice, however, it seldom happens that the supervisor can leave a department for more than a short period, for a vacation or for a few days for other purposes. Occasionally this difficulty has existed because the supervisor has feared the loss of his job; he has felt that his job was safer if a man who knew how to fill it could not immediately be found. In most cases, however, the reason is that the assistant partly needs the confidence which comes only thru extended experience in running the job, partly because of lack of knowledge in methods of management, and of the true relations between his own and other departments.

One of the first considerations in contemplating an instruction course for supervisors calls for the filling out of the assistant's experience so that he may fit into his superior's shoes and relieve him to any extent that may be necessary. This may necessitate the plan of starting the instruction work by planning to give instruction first not to the supervisors themselves but to assistants. Under certain circumstances this has great advantages, particularly where the idea is more or less new to the supervisor and where the man who is conducting the work is also called upon to introduce it to the supervisors. The idea of installing an instruction process for *your assistant* is a very much more easily accepted proposition to start with, than to profess in an out-and-out cold-blooded manner that the company is providing instruction for the supervisor himself. No supervisor can deny that any instruction arrangement that the company is willing to install for



The committee on special training of one of the larger Edison Industries the Edison Phonograph Works, consisting of the general superintendent and superintendents of the assembly, drill press, lathe and screw departments. This committee is consulted on every possible occasion in order that the course of instruction and the actual work of those receiving the instruction may be very closely related.

the assistant who is not absolutely needed on the job every minute of the day should be taken advantage of.

The first process after such a group of assistants is started is a sifting process. A considerable proportion of them will show up as being both mentally and temperamentally unfitted for the job of supervisor into which it has been expected to fit them. They show up well enough while working under cover of the routine of a department. The work should, of course, be done on the company's time, and in calling upon an assistant supervisor to take a course of instruction certain small sacrifices of time and money are sometimes called for. On these points some men take positive stands which show them up as being unfitted for supervisorship. Mental attitudes of opposition to the policies of the concern and certain kinds of character show up which are fatal to good management but which thrive in the mechanical duties of a department. The writer has yet to find a group of men under instruction as supervisors where changes due to this condition have not taken place.

To supply the places created by such defection the training of a second group is in order. The members of this group should naturally be chosen from among the younger members, possibly mechanics at the bench, who have the necessary mechanical experience and temperament. In a metal manufacturing industry making small parts, it is usual to look among young toolmakers, tool setters and similar mechanics. This is naturally a somewhat more difficult group to instruct in that they are further from the actual supervisory job or undertaking for which the instruction is given. They are also much closer to the men at the machines and at the bench than either the supervisors or assistant supervisors; it is, therefore, much harder to bring them around to the management viewpoint.

The last group which should be tackled is that of the supervisors themselves; the assistants and the near-assistants are so much underpinning for the supervisory structure, and unless the number and size of the individual units of support are sufficiently large, it is scarcely any use putting a further load on the top, as such addition will often dangerously overload the structure. Once the structure has been thus built up, however, the efforts in the direction of instructional work for supervisors can go forward without limit. Instruction for this group can be very closely tied up with the actual difficulties in the various departments and can include all phases of management, including the larger stock outlook of the influence of the industry on conditions in the community and in the country; and vice versa.

As distinguished from the three general aims already set forth, a much more definite and immediate aim is needed into which the various units of instruction composing the course can be tied, whereas the general aim of all history study may be the furnishing of a guide for future happenings, this is accomplished thru the studying of events occupying a definite period or place. Under the circumstances any event forming the study for one unit is definitely connected up with the history of that period as a whole, thus is the position of each unit definitely known. Similarly if the student of a course of instruction in supervisory methods does not see just where each unit fits and what the immediate tangible aim is, a befogging process sets in. The connection is broken and he begins to lose interest. It is, therefore, necessary to set out the aim for which all improvements in management are designed; if possible, the aim should be one which is immediately recognized by the management as being of the first consideration in any manufacturing outfit, and in the performance of which, worker, management, community and country will be benefitted. An answer is that all manufacturing activities should center around "the decrease in the cost of production." This definition takes into consideration that the material in an article of manufacture may need to be improved and increased from time to time, finish may be bettered, a larger quantity of packing may be used, as may seem desirable. Nevertheless, in spite of all improvement, the ultimate aim should be a decrease in cost of production. This is a suitable aim into which all the work connected with a course such as the one under consideration can be tied up in. It can thus be used to vitalize all the units of the course in question.

The kind of men required to give a course of instruction for supervisors and the method of giving the instruction are closely bound up together and cannot very well be separated. The first requirement in any sort of vocational instruction is that the man should thoroly know his trade. Those who have studied the early experiments of having a teacher instruct in a trade, simply because he was a teacher, with perhaps a few months' experience at the trade in a normal institution, will not doubt the necessity of starting with an instructor who has been thru all the phases of supervision and who furthermore has sufficient insight into the tendencies in industry generally, and keenness in forecasting future developments so that he may keep well abreast of certain industrial questions likely to be raised by the students.

On the other hand, it is just as necessary that the man who conducts the course should know *how* to instruct as it is that he should know *what* to instruct. In other words, to give proper instruction, two features are included in the scheme of things; these are *content* and *method*. Departments of universities in which the art of teaching is taught, like those connected with Columbia and Harvard, have existed in this country for many years. It is necessary to recognize the fact that if the instructor is just "making a stab" at instructing without thoroly understanding the principles of teaching, it is more than likely he will make a poor job of it. Generally speaking, therefore, in order to teach a trade the instructor must be a tradesman; that is, he must have actually worked at the trade he is to teach, be it supervisory or other work, and secondly he must learn to teach. In making a study of the previous training of instructors in shipyard trades, the United States Shipping Board found that the average trade experience of 1,098 men, used by it as instructors, was over ten years. And the correctness of the training methods of the board can be gauged by the fact that the learners trained by them produced in a year over half a million dead weight tons of shipping.

Presuming that the prospective instructor of supervisors has had the necessary experience, the next most pressing question is as to how the man who has already learned the trade of supervisor can in addition learn the altogether new trade of instructor. The reply is that it is a hard matter to find a course of suitable instructor-training which will just apply. It should furthermore be borne in mind that the psychology upon which correct teaching is based is a science, and teaching, or the correct actual carrying out of the psychological principles, is an art. The one does not immediately follow the acquisition of the other, but rather they are coordinate and parallel. So that if suitable instructor-training courses are found and attended by the prospective instructor there still remains the second large factor to be taken into consideration.

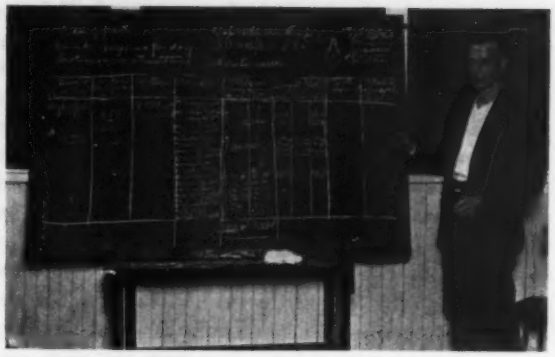
Referring again to the United States Shipping Board, this government department had during the war period a regularly organized instructor training course, which the prospective instructor was called upon to attend before being allowed to instruct in his trade. The University of Illinois has had an instructor training course organized since 1918. The University of the State of New York is attempting to do the same thing in several localities thru the activities of Mr. Lewis A. Wilson, its director of vocational education.

Many other attempts are in a state of development. The difference between the regular normal courses for teachers and the courses for instructors now being developed consists in avoiding all the unnecessary work in the normal courses, and in the cutting down of the time required in the course to the lowest possible limit.

To a man with some experience in giving instruction, and to the man who cannot possibly connect up with a suitably conducted course of instruction, the books of the famous American teachers will furnish many a good piece of instruction on how to teach. Latterly Mr. Allen of the Federal Board of Vocational Education has also brought out an excellent book on the training of trade instructors. All these will contribute their quota to the consolidation of the principles of teaching in the mind of the prospective instructors. One thing must certainly always be borne in mind—that teaching is just as difficult a thing to acquire as any other trade or art and as such the necessary effort and time must be expended in order to acquire it.

Generally speaking three methods of conducting the work of instruction for supervisors have been noticed. These may be termed the lecture, the correspondence, and the developmental methods. The lecture method consists of giving to a group of students a continuous flow of language on some particular phase of management or supervisory work, possibly illustrated with charts and graphs, and in some cases lantern slides. The one great disadvantage of this method is that it presumes a large capacity for absorption on the part of the student. The student is expected to take notes and apply them. He is expected to follow the lecturer step by step and let nothing pass—since the lecturer is presumably giving worth while information in every sentence that he utters. But the student can only really absorb the instruction by doing his own thinking. By the same token it is scarcely possible for him to do this, except in the case of the exceptional student. The reason is that the instruction must have been all thought out before, and therefore when it takes shape, it takes shape at the lips of the lecturer too rapidly, much too rapidly for the student, even if he can do his thinking as rapidly as the lecturer can pronounce his words. The rapidity of developing ideas by the instructor in the lecture method usually shows up in the range of the work attempted in each individual lecture, which frequently contains a sufficiently large number of distinct and separate units to make as many lectures.

The lecture method requires a high state of mentality and preparation on the part of the student and because of conditions in industries which have existed so far, this is not usually forthcoming. Therefore, the natural thing for the student to do, under the circumstances, is to sit back, take it easy and let the lecture roll on. The lecture is not without its uses. It can be made inspirational by suitable oratory and the personality of the lecturer. But generally speaking the



In order to consolidate and make permanent the student's experience in working out details of construction, he is called upon to give his own thoughts on the subject to the group.

lecture method used among supervisory forces of the average manufacturing concern does not constitute good teaching.

The correspondence method, be it in the form of books, or written lectures sent to the student, which he is supposed to study "on his own hook" are usually much more suitably divided up as units, progress in a much better order and possess excellent structural qualities. But here again the carrying thru of a piece of instruction by correspondence methods calls for exceptional qualities in the students. The average man is sophisticated. A mere statement frequently does not clear up a bad situation that he has in his mind, and only the presence of an instructor will do that. He may write several times for information, but interest is dissipated over a period of time, and each time he receives a reply his interest is weaker. Furthermore, it requires almost superhuman efforts to avoid putting off periods of study time after time until they become an unknown quantity. Again, while it may be desirable to eliminate the supervisory material which is known to be hopeless, yet the average supervisor is not other than an average man and it is just to fellows of this kind that the instructional process must be applied. Various conditions of study in the correspondence method have been applied, such as the gathering together of a crowd of men to study *by correspondence method,* but the weakness is fundamentally the same. So far as is known those who actually graduate from the well-known correspondence courses do not exceed five per cent. And to say that the correspondence course should be given only to the best students or to students of the higher type only begs the question.

The developmental method aims at building up the student, from the point *where he is.* It calls upon the student to think for himself. It develops a consciousness in the student of some suitable previous experience onto which the new mental experience, which the instructor is going to put over can most easily and readily be tackled. The actual medium whereby this may be accomplished can be thru suitable questioning, suggestion or illustration, or lecture under certain circumstances, or a combination of all four, all subservient to

the creation of a reaction which can be made the medium of the developmental process. The process may be defined as action taken to create a reaction in order that the student may become conscious of certain facts previously determined in the instructor's mind. This definition calls for a real absorption, and requires that if the unit idea is not absorbed, the process be stopped until it is, in order that it can be used as the basis on which to build the next idea. No process which does not take into consideration the quality and previous experience of the learner, his mental capacity for absorbing instruction and the determination that he really knows one unit before proceeding with the next, can be said to be developmental. The whole process calls for consideration of the individuality of the learner to the highest degree.

Something still needs to be said of the actual contents of instruction for supervisors. It has been stated that the one aim in which all are interested is the decrease in the cost of production. This then can be made the motivating influence of the whole work, be it in the knowledge of an exact method of making a metal part; in the knowledge of properly giving instructions to workers; in suitably taking care of discharges; or in proper employment methods; all the points in industry can be hitched up to this general heading. In fact this feature of decreased cost of production is of such large and prime national importance that it would not be too much to say that nothing should be introduced which does not contribute to its effectiveness. Naturally any attempt to organize instruction for the decrease of production costs rather aims at the removal of all those things which prevent the decrease of cost. The whole study can be summed up into the words: What are those things which prevent the decrease in the cost of production and how shall they be eliminated? Under this heading the instruction may be said to deal with three phases, namely: actual production methods, study of human relations, and the elimination of various small personal outstanding misunderstandings and misconceptions.

The last is the real starting point, or at least is something which should be taken care of almost immediately. It always happens, especially among minor departmental supervisors, that numerous small things have made so large an impression on them that it is sometimes worse than useless to attempt to give instruction until such feelings are eliminated. It frequently happens that a worker will argue with his feelings and not with his reason. "Primarily the way men reason is determined by their emotional attitudes."[1]

These remarks are intended to refer to small misunderstandings which exist by the score as to why a certain rate was changed from twenty-five cents to sixteen cents; why a certain stock room needs two days to deliver material; why profit is the outstanding requirement in a manufacturing business. A crowd of young men will approach a course of instruction with such small points developed in their minds as vital issues, and no matter how carefully the work is planned and how interestingly delivered, the small issue acts to stop the progress of the whole thing. If these are not immediately taken care of the "comeback" almost invariably is, "yes, very true, but why so and so",—something having nothing to do with the unit of instruction. These are small matters actually connected with the fellow's daily work, which need to be taken care of immediately. A man with questions of petty injustice sticking out all over him will accept the subject of the session with great reservations, even if he does not think you are trying to out and out muddle his ideas. Of course, this does not advocate an attempt at organizing the first unit of a course for the discussion of misunderstandings. Usually questions of this sort come up naturally and easily during the first few units of regular instruction. The plea here made is rather that they be encouraged and answered as a means of improving the quality of the instruction.

This phase of the subject calls for the willingness of the management not only to permit of the full explanation of managerial methods, the giving of figures showing exactly how rates, adjustments, and other figures are arrived at, but also to permit of the full discussion of certain social questions, the ethics of increased production, the relative merits of some strike or other occurring in some other part of the country about which the men desire information. In the Edison factory, Mr. Edison has not only always been anxious to pay his men well and to reduce working hours, but has encouraged the liberal viewpoint; as witness his statement: "A new order of things is emerging from the events of the last five years. Whatever may intervene, the ultimate result is going to approach more closely a square deal for everyone as humanity's reward for the sacrifices that have been made." The discussion of production almost invariably raises the question among the students: "Why are certain outside things happening?"—giving facts and figures about a disturbance in some other part of the country. Such questions cannot only be invariably answered but can be answered in such a way as to remove misunderstanding and leave the enquirer in a satisfied frame of mind. With very few exceptions these men are not agitators, they are not men on strike, they merely seek information; enlightenment will usually do more to straighten them out than the attempt to avoid all reference to strike and other conditions.

Even where such questions have not immediately and naturally come up, investigation after a meeting has almost invariably proved that they are there just the same. This matter is really a test of the sincerity with which the employer undertakes this work. If he thinks the work can be given without touching upon or explanation of such vital questions, he is fooling himself and is in reality wasting his money, since in-

[1] Wolf in "Works Committees."

struction acquired with such mental reservation is really no instruction at all. Frankness in approaching the men is most usually more than made up for by the subsequent confidence in the approach to succeeding units of instruction.

In order that the fullest opportunity be taken to awaken and develop the students' interest in the course, it is a good plan to let the students work out the general structure of the course themselves. If this is done they are already anxious to dissect and analyze the various items which go to build up the general structure. And no unit is given without its exact position, relative importance, and use in the course being known. A crowd of students themselves worked out under the heading "decrease in cost of production", the general factors which go to bring about increase in production, increase in quality, decrease in overhead per unit, decrease in breakage of small tools, decrease in labor turnover, decrease in potential unrest. Each of these headings contribute to the reduction of cost of production, and the activities which cannot be included under them are practically nil. Under increase of production can be included the methods and calculations of setting up standards of performance, the setting up of methods to arrive at those standards of performance, and the consideration of those factors of human makeup which contribute to the best accomplishment towards these ends. That is, in somewhat more cut-and-dried terms, analysis, routing, scheduling and the cutting out of waste.

The factor "increase in quality" is self explanatory; it should be understood, however, that this includes a study of those features which constitute good inspection requirements, and the qualifications of men which make for an increase of quality. The giving of proper instructions is also included. A study of the breakage of tools requires some form of analysis, the setting up of standards, the following of standards and a study of methods of training to bring about this end. The reduction of overhead is of the utmost moment and besides a study of those conditions which will bring about savings in light, power, floor space, and the more obvious items, are such considerations as the decrease in overhead due to the reduction of absenteeism, time-saving by hospital and safety-first operations, centralization of employment and training activities. Decrease in labor turnover calls for a study of the treatment of men generally, handling of green men, interest motives, the desirability of physical examination and nearby residence. Finally the question of potential labor unrest should bring in a study of larger national movements and tendencies, thru the study of good publications and consideration of the relation of costs of living to wages, education and training, housing factors.

It will be observed that each of the items under the general headings permits of a large study in itself. The number of units and extent to which they are studied should be determined by individual factory needs. And as has previously been pointed out, the student will be benefitted by the extent to which he participates both in the setting up of the structure of the course and in the discussing of individual units. For this reason it is not desirable to lay out any large number of definite units in advance; the plan furthermore brings in the advantage that absence of objection on the student's part to the nature of the course will be in proportion to the student's participation in laying out the plans for the course. Neither need any important item of instruction be neglected under the circumstances; for while the instructor may have his basic units definitely set out in his own mind, the students will in nearly all cases, once the ball has started rolling, exceed the instructor's anticipation. The tendency is the other way around—to include all sorts of odds and ends, relevant and irrelevant, the presence of which in itself forms a basis of discussion, and ends in a severe sifting process. In other words, it is just that preliminary planning which should be capitalized to the utmost.

From this standpoint it is undesirable to attempt to utilize a course which is being used in some other concern. Outside of some general ideas on the subject, the development should be from within rather than from without. This is urged as being of great importance. One other feature ties up with it; and that is the actual study of shop conditions on the part of the instructor while the work is being given. If the unit being given deals with certain production costs, it is of the utmost help to the instructor to know just how each student or department stands with regard to those costs; no attempt to hoodwink the instructor will pass under the circumstances. And he can furthermore watch the effect of his instruction in taking care of the shop problem he has in mind. The same idea of obtaining advance departmental figures holds good with regard to labor turnover in individual departments, overhead costs, number of rejections and many other features. This phase is of the utmost moment if the instruction is to be at all effective.

In the case of highly specialized problems, the expert opinion of the person directly responsible for the working out of the job should be freely asked, particularly when specific instances and objections are brought up by members of the group. Such a contact which is often not possible under any other circumstances is highly desirable. The expert sometimes finds a frank statement of opinion on some of his schemes which comes as a surprise to him; this is not without a very desirable effect on all concerned.

The question which still remains to be answered is, What is the most desirable way of installing such a training arrangement in a department or branch of a factory? This question, of course, assumes that the management has already agreed to install some such arrangement, and are ready to seek the cooperation of all the departments concerned, to install the arrange-

ments for conducting the work with the least possible stir and friction, and if possible by enlisting the enthusiasm of the most responsible department heads in advance. The reply is that the very basis of all democratic forms of government in industry and elsewhere, is to lay all the cards down on the table and to make the facts known immediately and individually to the supervisors in charge of the departments which are expected to participate in the work. It is unusual to find a supervisor who will not admit the value of any form of instruction. The usual reply is "you can never know enough." If, however, the work is started without the preliminary frank personal interview that lack of contact is somehow or other never quite made up for. And as a general thing this pioneering work should be by the prospective instructor himself. It is a hard road to travel, but the solidity of the outcome more than makes up for the difficulty in making personal contact all the way around. And then as a result of such contact and the opportunity for the formation of opinion as to the attitude, personal merits, and temperament of each supervisor, it is possible to choose a strong committee of from five to ten supervisors, who will undertake to be more or less responsible for the conducting of the work. While they would not exactly be responsible for method, they will be an invaluable source of advice as to content of the course, in feeling out general tendencies and sensing the trend of opinion as to the value of the work, and in many other ways to participate in the management of the work.

On the establishment of such a committee, the instructor or director places himself in the position similar to that say of a surgeon. The patient has a great deal to say as to when and where, and under what condition the operation shall be done in order to secure the best satisfaction to himself. The patient knows, however, that because of the surgeon's experience and knowledge, the actual doing of the job must be left to the surgeon himself. The committee stands in exactly the same relation. The surgeon does not dare to stab his patient when he likes and for any complaint he thinks the patient has.

The democratic viewpoint of the case is to take a representative group into counsel for the work, and tho many suggestions are likely to come up which the instructor may know that he cannot carry out, the higher authorities are usually able to very quickly settle one way or the other, just what it is most desirable to do under the circumstances. In any case, because of the possibility of many misunderstandings on the nature of this work and the tendency toward wrong interpretations, frequent contact and the free discussion of all phases of the work, between the person in charge and representative supervisors of the factory, is of the utmost importance; this, more than any other feature, will be responsible for the smooth running of the work.

SCHOOL BAGS AND OTHERS

Katherine H. Scott, Supervisor of Art, Mason City, Iowa.

Since the knitting bag has become a thing of past days, an ever increasing desire has grown up for smaller and more fanciful bags and has brought into use expensive creations of beads and ribbon, leather and sanatas. The girl of school age has shared in the craving for bags and seeks similar articles of inexpensive character. Anything that dangles fills this need, be it finished with tassels or cord, or fashioned only to swing from the hand.

So as my interest lies in trying to appease the desire for beauty in the creation and construction of problems within the reach of all school girls and boys, I have introduced the following problems of my own origin, which may be made with but slight expense and which educate, satisfy and delight as well.

An Oriental Coin Purse.

At any five and ten cent store, buy a gas mantle for an inverted light. Remove the mantle from the box, preserving the mantle for another problem.

From the box remove all paper covering and pierce a hole thru the center and top of the box. Paint the inside of box and lid with cobalt blue tempera color. Cover the outer side of lid and bottom of the box and one-half inch from the bottom edge up the outer side of box with a coat of Prang's enamelac, cobalt blue. Let this dry thoroly and when dry and hard, glue a small button mold over the hole in the top of the lid, outside and inside and on the bottom of the box, and cover both with a second coat of enamelac. Paint the button mold on the inside of the lid with tempera color.

Make a knotted cord from strands of silk floss or thread, the color corresponding with the tone used on the box. To one end of the cord, fasten tassel made from the same thread and enriched with bright colored beads of complementary colors. Slip a cord thru the hole in the button mold and the bottom of the box, then thru the button molds on the inside and outside of the lid, knot tightly, leaving only enough leeway for the lid to be raised and slipped back from the box when open. The lid does not raise up. Slip on the cord other bright beads, large and small. Again knot the cord loosely and add other beads, bringing the end of the cord back thru the loose knot and fastening the end with a stitch. This forms the cord handle.

Cut a piece of small figured cretonne one inch narrower than the height of the box and long enough to fit around the body of the box: Also two pieces of lingerie tape the length of the cretonne band. Dip the tape into blue dye to harmonize with the predominating color. Glue the cloth to the box, allowing the half-inch

ORIENTAL COIN PURSE.

enamelac band at the lower edge and on the lid of box to remain uncovered. Edge with lingerie tape glued on as a finish.

If bright, contrasting colors are carefully and thoughtfully used this little coin purse will suggest the Orient and will bring dreams of quaint oriental damsels in the bright and showy dress of their colorful countries.

This problem our girls and boys of the seventh and eighth grades have worked out so successfully that I want to give other school children the opportunity of producing these charming little color notes which may be put into practical use.

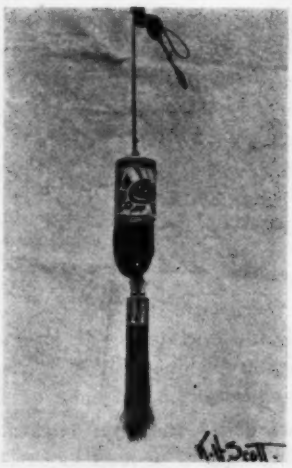
A School-bag for Grades Five and Six.

Another interesting problem involving little expense and creating enthusiasm in its development, is a school-bag made of burlap and enriched with stitchery.

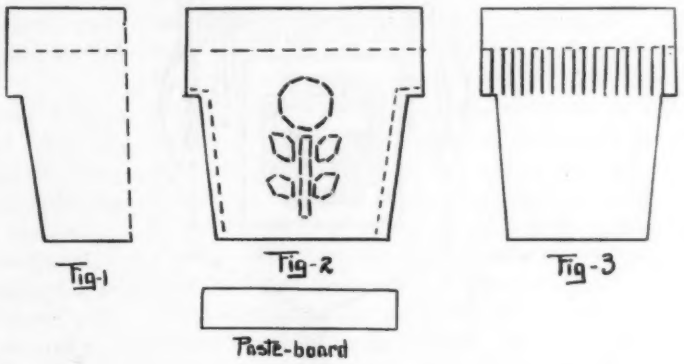
Take a piece of natural colored burlap 12″x18″ and a strip cut on the straight 4″x18″.

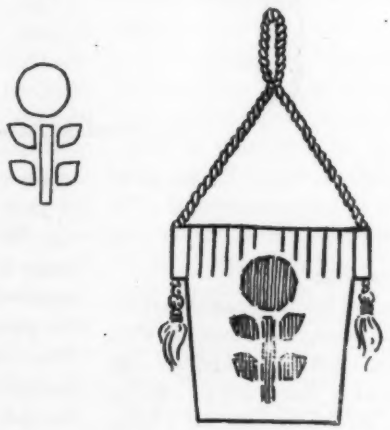
On one of the eighteen inch edges of the larger piece of burlap, turn down a hem of 1½″ and fasten with long blanket stitch, using black Angorina yarn; stitches to be about one-half inch apart. Fold the cloth on the short dimension and on the opposite end fold in the corners two inches from the lower edge, forming a point in the center of the cloth. Fig. 1.

Cut a design motif from cross section paper to use as a decoration on one side of the bag. Keep the design simple,—a butterfly, bug or flower shape inside a single



ORIENTAL COIN PURSE.

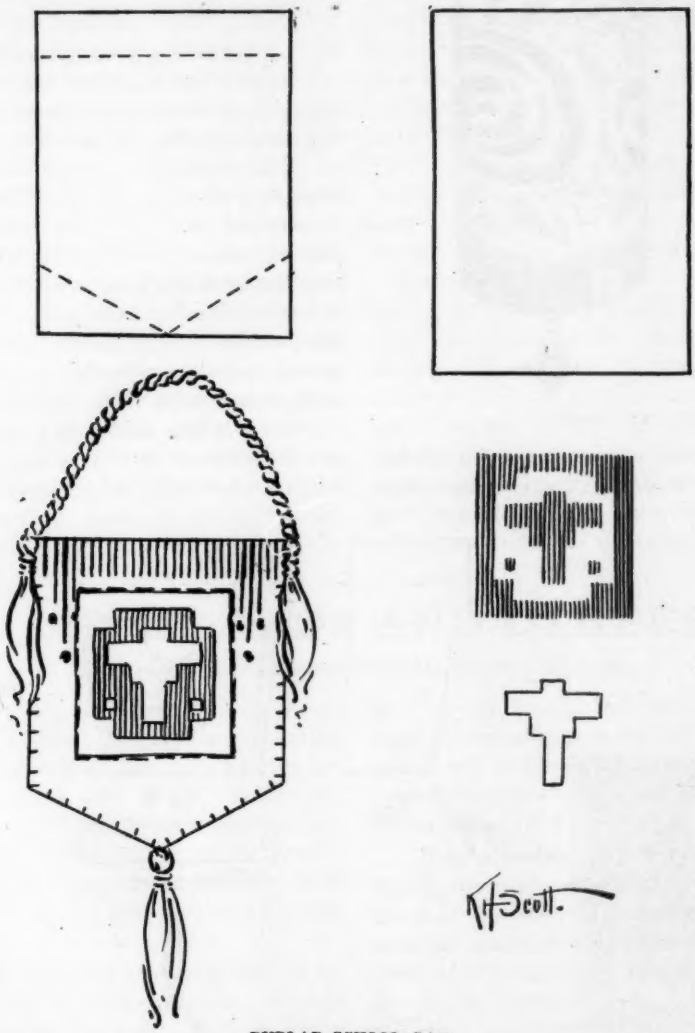




FLOWER POT BAG.

border in a square or without a boundary line. Transfer the design to another piece of paper and try out a color scheme on it. When satisfied, baste this colored unit of design on the center of the cloth shape on one side, and work over it with yarns to match the color used on the paper. Use long stitches and French knots.

Turn in the edges of the long narrow strip on the long dimension and stitch both edges with black yarn using the blanket stitch. Sew the ends of the strip to the center of the two sides of the bag. To the point at the bottom of the bag fasten a big yarn tassel. The tassel should harmonize with the colors in the bag proper.



BURLAP SCHOOL BAG.

Flower-pot Bag.

While the upper grades are busily engaged making bags for the holidays, and the primary children are stick printing percale and gingham marble bags and hot dish holders, our little fourth graders must not be omitted from this delightful work. So I have planned a little bag for their very own.

First, we cut our pattern from a piece of paper 7″x9″, as in Fig. 1. Then we fold on its shorter dimension a piece of plain blue, green or brown chambray which is cut 7″x18″. We fold it again on its long dimension and place the pattern on the outside of the fold. Pin the pattern to the cloth and draw around the pattern or cut along the edges of the pattern. Of course, we keep the open edges of cloth at the top of the pot shape.

On one side of the pot-shaped cloth arrange a simple motif with little block shapes, cut from paper; baste in place on the cloth and work over with long stitches of yarn in complementary colors. Fig. 2.

Sew both slanting edges on the sides of the pot shape to the extension of the rim, Fig. 3; turn in the upper edges A, B, Fig. 3, over to meet at C, D. Cut two pieces of pasteboard ¾″x6½″, and place pasteboard strips inside of the turned-over edges of the cloth, blanket stitching a hem over the pasteboard. Finish the ends with overcasting stitch to keep the pasteboard in place, and fasten a knotted cord at the extreme upper corners of the bag. Make tassels of corresponding colors and sew to both lower corners of the bag.

Constructing a Scale for Grading Mechanical Drawing in the High School

Roy S. Ray, Director Manual Training, Shelbyville, Ind.

THIS paper is written for the purpose of showing the results of one attempt made to establish a standardized scale for the grading of plates made in the subject of mechanical drawing in the high school. It is intended primarily for teachers of this subject whose attention may not have been directed to the subject of "standardized measurements." This matter is neither technical nor exhaustive but is submitted that at least interest may be aroused among teachers and that the work may be carried on to a far greater degree. Very little has been done on the question of measurement scales in this field and much may be accomplished. The work described in this article is rather elementary but it is possible to construct a thoro standardized scale on this plan only after much cooperative work on the part of those interested. It is believed that any teacher who studies carefully the description given in formulating this scale will have no difficulty in creating a scale in some form which will prove of value to him in his classes. This scale as devised gives a greater definiteness and a much more accurate basis for grading the work of mechanical drawing in the high school, and teachers of various schools will be greatly benefited by a careful study as to how it has been worked out.

It has standards which are indisputable because in this way a teacher can defend himself when approached by a pupil who is desirous of knowing why he received a grade above or below (more often the latter) that which he anticipated. But if the quality, neatness, accuracy, etc., of his plate is compared to those of the scale he can readily see the reason for receiving the grade given. If a teacher gives an arbitrary grade to a finished plate and in a few weeks or perhaps days is called upon to grade the same plate, he will in all probability not give it the same mark as before. If two different teachers grade the same problem made by two pupils, they will not give the same marks when the results are compared. Hence we have a reason to doubt the accuracy of the grading both, furthermore there is a wide difference in the opinions in most cases. These two judges grading the same plates by comparing them with the scale will agree rather closely, thus a teacher and pupil will have a reason to believe the grading accurate and reliable.

A simple problem in orthographic projection was given in devising this scale. The same directions were given to the entire class under the direction of the teacher as follows:

1. Make an orthographic projection drawing of a frustum of a pyramid whose base is one and one-eighth inches square and altitude two and one-half inches. One diagonal of the square is parallel, the other perpendicular to the V plane. The pyramid is cut by a plane making an angle of forty-five degrees with the P plane, cutting the right element of the front view one inch from the base measured on this element.

2. The V, H and P views are to be enclosed in a space 4½ inches times 6¼ inches. (Approx.)

3. The border lines are to enclose a space six inches times eight inches.

4. Ink all visible lines in black ink.

5. Dot all projection lines in black ink.

6. Do the best you can and do not hurry.

7. Be sure you understand the problem before attempting it.

8. Trim the plate one-half inch from the border lines.

9. Place a number assigned you in the upper right hand corner with a lead pencil.

10. Use only the paper furnished.

When the plates were completed, some of which were very good and some very poor, they were ranked and given a numerical grade by the teacher in charge and these results were carefully tabulated on a large score card. Likewise other judges graded them and their results were recorded on the score card. Competent judges were secured from the ranks of college professors, school superintendents, college seniors and teachers of this subject in the various high schools of this state. The instructions given were to grade them in accordance with their usual custom of grading and arrange them according to their estimation of the best, next best, etc., giving each a numerical grade. Many of the elements which enter into the grading of plates are contained in the final result. Some had the same, others different standards on which to base their judgment.

It should be of interest to teachers of this subject to know that a majority considered accuracy and neatness of primary importance in the selection. Other elements which entered into the arranging were: carelessness or accidents which detract from the reading and understanding of the drawing, the extent to which the story is actually represented by the drawing, quality of lines, lines meeting at vertices of angles, etc. Several greatly overvalued, others undervalued certain elements. This clearly shows that when a number of individuals are called upon to judge work of this nature, many are nearly correct and some are in error because of overvaluing or undervaluing.

All of these judgments were copied on a large score sheet, first on the basis of rank, second on the basis of grade, third on a percentage basis of judgments.

Table I. (Basis of Rank.)

Plate No.	Judges	A	B	C	D	E	F	G	H	I	J	
1	.....	19	28	26	20	18	25	16	28	27	22	....
2	.....	9	1	1	1	1	6	2	7	7	4	....
3	.....	8	10	7	9	9	7	11	10	9	7	....
4	.....	2	3	3	3	2	5	3	2	4	2	....
5	.....	1	4	13	8	4	2	1	1	1	1	....
6	.....	4	7	12	5	5	4	6	6	3	5	....
7	.....	7	9	6	6	8	17	7	3	8	8	....
8	.....	13	13	8	13	19	13	10	11	14	11	....
..	.....	..	..	..	..	..	..	..	..	..	..	....
..	.....	..	..	..	..	..	..	..	..	..	..	....

Table II. (Basis of Grade.)

Plate No.	Judges	A	B	C	D	E	F	G	H	I	J	
1	.....	76	30	65	70	74	53	80	25	50	75	....
2	.....	90	95	99	100	98	94	98	95	95	93	....
3	.....	91	88	93	90	91	90	85	92	94	90	....
4	.....	94	94	97	97	97	95	95	99	97	95	....
5	.....	95	94	86	92	96	99	98	100	99	98	....
6	.....	94	92	87	95	95	96	90	95	97	93	....
7	.....	92	90	94	95	91	74	90	98	95	88	....
8	.....	85	84	92	83	73	80	85	91	80	84	....
..	.....	..	..	..	..	..	..	..	..	..	..	....
..	.....	..	..	..	..	..	..	..	..	..	..	....

Table III. (Percentage Basis of Judgments.)

No.	1	2	3	4	5	6	7	8	
1	x	0	0	0	0	0	0	10	.....
2	100	x	90	50	40	60	80	100	.....
3	100	10	x	0	10	10	20	90	.....
4	100	50	100	x	40	80	100	100	.....
5	100	60	90	60	x	80	80	80	.....
6	100	40	90	20	20	x	80	90	.....
7	100	20	80	0	20	20	x	90	.....
8	90	0	10	0	10	10	10	x	.....
.. ..	..	..	..	..	..	..	..	..	.....

This process was carried on thruout the entire list and those plates were selected which were judged better than the preceding one by eighty per cent of the judges. By this method seven plates were selected to constitute the scale. A comparison of these shows that there is a degree of difference in quality which is easily recognized.

(Method of reading table.) Comparing the numbers in the vertical column with those on the horizontal, no judge said that plate No. 1 was better than No. 2, No. 3, No. 4, etc. One hundred per cent of the judges said that No. 2 was better than No. 1, ninety per cent better than No. 3, fifty per cent better than No. 4, etc.

.....(80%).....
.....(100%).....
.....(100%).....
.....(100%).....
.....(90%).....

15 (80%) 27 (90%) 18 -1 -24 -22 -30 -26 (40%) -25 -16 -19 -20 .....

.....(80%).....
.....(70%).....
.....(60%).....

Tables I and II were averaged which gave a tentative arrangement for determining the scale. These showed that plate No. 15 was the poorest beyond any reasonable doubt, hence it was used as the starting point and continued as follows by using table III.

Plate No. 27 was judged better than No. 15 by eighty per cent of the judges; No. 18 was considered better than No. 27 by ninety per cent of the judges; Nos. 24, 22 and 1 were considered better than No. 18 by seventy per cent of the judges and thus far would be on an equality but by comparing them with four other plates as shown, No. 1 was next in order, then No. 24, then No. 22. This method of direct and indirect comparison was used to determine the entire order.

(70%) 16
(70%) 24 (50%) 25
(70%) 28
(70%) 19
(60%) 16
15 (80%) 27 (90% 18 (70%) 22 (70%) 25
(80%) 28
(60%) 19
(60%) 16
(70%) 1 (50%) 25
(40%) 28
(60%) 19

Table II when averaged showed the highest numerical grade should be 96% and the lowest 34%. These grades were arbitrarily assigned to the best and poorest selected for the scale. Referring to the method of selecting the plates to make the scale in the preceding paragraph it is shown that No. 27 was judged better than No. 15 by eighty per cent of the judges, hence it was considered eighty points better. The plates between Nos. 27 and 26 were each judged better than No. 27 and their percentage of better judgments were averaged, this result was added to the eighty per cent judgment of No. 26 to No. 27 and the mean found which showed that No. 26 was eighty-nine points better than No. 27. The relation between each succeeding plate was worked out in the same manner and the numerical grade assigned was worked out on the basis of proportion which resulted in the scale as follows:

No. of Plate.	Dif. of points.	Total points compared to No. 15.	Num. grade.
15	0	0	34%
27	80	80	44%
26	89	169	56%
20	67	236	64.5%
8	87	323	76%
14	83	406	86%
5	74	480	96%

The plates selected to make the scale were chosen as follows:

The method employed in grading plates is similar to that of scoring samples of handwriting by the Ayres's scale. The finished plates are placed alongside those of the scale and determined to which it most nearly corresponds. The number on the scale shows the numerical grade to be assigned if they are of the same quality but if not the teacher must determine the grade as the intervals between the percentages are sufficient to warrant individual judgment. When the scoring is done twice it is more accurate than if done only once but the rating should always be made in ignorance of the ratings previously given. Naturally there may be

slight disagreements in the two scorings but they must be settled by careful decisions. Another method which would result in a more accurate grading than the methods just described is one in which several competent judges score them independently according to the score. These scores are then averaged, and the result is the true score. It is true that the values shown in this scale are not absolutely correct but it is accurate enough to be of great value in rating finished plates in the high school.

COOKING CLASSES AT ASBURY PARK, N. J.

A Syllabus in Cooking—a Problem for the School Print Shop

William J. Barry, Instructor of Printing, Asbury Park, N. J.

SOME eighteen months ago it fell the lot of the writer to print a syllabus for the cooking classes in the seventh and eighth grades of the city schools. We were all delighted to get such "copy." The recipes were short and the composition very simple. The recipes for the books were, in the main, old rules used by the compiler in her home, but worked out scientifically for the domestic-science classes in the seventh and eighth grades.

In a few instances recipes were used, with permission, from Mrs. Lincoln's and Miss Farmer's cook books. Heretofore, recipes had been copied by the pupils thru dictation and many mistakes were thereby made. Not only is the book used in the classes, but the pupils buy copies to use in their homes. The books have a ready sale in the high school also, as many of the girls who take the work in the high school have not had cooking before and this book appeals to them, because of its simplicity and accuracy. In many cases, friends and neighbors of the pupils buy the books.

The older girls report that the standard of cooking and sanitation in their homes has been raised thru their work in the school with this book as a text. The mothers have taken more interest in the work done in the domestic-science classes since the book has been printed and many use the book themselves.

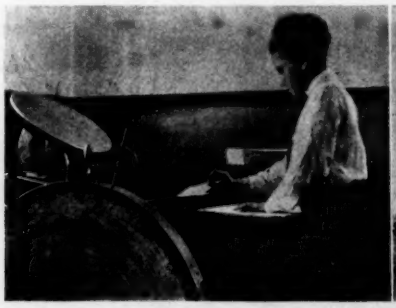
A printer's estimate of the cost of publishing this book some years previous had been about 35 cents a copy. The School Print Shop turned out the book, with a better quality of paper at four cents per copy. Seven hundred copies cost about thirty dollars. It was great fun to read the names of the good things as they were assigned. Many a time we wished we might be near the cooking room when the "strawberry shortcake", "peach ice cream", "doughnuts", "roast turkey with cranberry sauce" and many other delicious things were being prepared. Our hopes have been realized many times this year. The girls are evidently making very good use of the book. Only yesterday one of the girls served some delicious fruit salad and another day, apple pie.

The problem for a grammar school or high school shop would be hard to beat from every point of view. English composition, punctuation, spelling, mathematics, and mechanical skill are combined to produce the proper result. An illustration for the "table setting" was drawn and the cut made by one of the boys from a linoleum block. The permanent form of this kind of printing which is so intimately connected with the school work, does a real service to the school community and perhaps to the community at large, altho not necessarily enduring in itself. It is also material which compares favorably with trade or commercial work. It appeals to the girls and the boys alike, being a record of their accomplishments. Perhaps the highest ideal is that the material shall make its appeal to the boys and to the girls on the grounds of its own claim for recognition and permanency.

The printing of the page may be considered as one step in the progress of the thought from its inception to its general transmission in permanent form—the book. So far as material form goes, the book is the final, perfect form—the crowning glory of all enduring literature. So the idea of selecting favorite recipes and putting them into print with their own hands, and finally embodying them in a book is an extremely alluring one to the pupils.

The boys are started very slowly into the work; first making them familiar with the arrangements of the shop and the names and locations of the various materials and supplies. The shop is equipped with a

generous supply of 10-point Author's Roman body type, leads and slugs, an assortment of italic, script, adstyle, post monotone, gothic, old English, and ornaments, borders, brass rule, wood and metal furniture, star composing sticks, a 10″x15″ Chandler and Price power press, a Pilot lever press, a 24″ paper cutter and proof press.



FEEDING PAGES OF COOK BOOK.

CUTTING LINOLEUM BLOCKS FOR XMAS.

The shop is also equipped with a 48″x72″ Savage imposing stone and frame, with racks for 414 steel 9″x13″ galleys—placed in sections of 23 galleys each. In a shop where nearly 200 boys are being instructed weekly some such arrangement is necessary and if such a stone can be had the work may be carried on very easily. Each class is assigned a group of 23 galleys, which are numbered,—each boy a galley in which to store his work. A foreman, appointed each period, looks after the galleys and the work of the shop as well. Each member of the class is assigned a special job to look after each period, such as care of lead and slug cases, the imposing stone, galleys, presses, etc. A record is kept of attendance, class galley numbers, work assigned and date of its completion.

A careful study is made of the California job case and the letters placed. A little competition to see who can point out first the proper boxes for the different characters adds a great deal of interest to the juvenile printers' work, many of the boys are able to master the case in one period. No one is ever allowed to mark the letters on the case. Blueprints of the cases are displayed above the cases to prevent a careless printer mixing the case if in doubt of the proper place for a letter.

Frequent tests on mimeographed forms keep the position of the letters firmly in mind. The point system is then taken up and the causes for its adoption and certain facts and terms are fixed in their minds related to their use. The story of printing from its beginning is taken up and the revolution caused by the invention of movable type is discussed.

Very simple composition is then taken up. A little poem which all the boys know is taken first.

"Whichever way the wind doth blow,
Some heart is glad to have it so;
Then blow it east, or blow it west,
The wind that blows, that wind is best."

The length of line is given, indentations, spacing, and rules for proper justification are explained. The various steps are gone through from picking up the stick to the lock upholding the stick, picking up type, movement of the hand so that no time is wasted, taking type from the stick to the galley, tying up, removing from the galley to the stone and locking up. The boys enjoy distributing type. In the study of proof reading, the pupils familiarize themselves with the proof marks. Most every composition as far as possible, is run thru the typical processes, coming out a finished product.

So the press work is begun as soon as the forms are prepared. Instruction by demonstration is given to the whole class, on make-ready, inking, feeding, removing chase, cleaning form and washing the press. Each boy is given a chance to operate the press under the closest supervision of the instructor. The work is arranged so that the students move regularly from one kind of work to another, thus securing a thoro knowledge of the printing processes. The paper cutting, folding, stapling and trimming are carried out as in commercial practice.

BOYS CORRECTING PAGES OF COOK BOOK.

FOREMAN TAKING HIS GALLEY FROM RACK.

FURNITURE POLISHES AND THEIR USE

Ralph G. Waring, Syracuse, N. Y.

AS I have studied the history of furniture design and manufacture, from time to time, it was strongly impressed upon me that even the very earliest of finishers of Egypt, Rome and India, realized the great necessity of caring for furniture after it had been made.

Some method was necessary to bring out the beauty of color and grain of the rare woods employed; for furniture in those days was the possession of only the wealthy. Craftsmen from the time of the Saxons treated the old English oak with many strange and weird concoctions to bring out the grain of the wood; to increase the gloss of its surface, and to preserve it against time and decay. The earliest method among the Egyptians called for the use of oils and waxes, since they were available in commercial quantities, even in those days of transportation as bad or worse than those now in vogue. These materials, however, had their shortcomings. The oils did not dry hard enough, since olive oil was cheapest and best obtainable; and the refinement of beeswax, to eliminate its honey content, had not been successful. The result was a combination requiring great labor in order to rub up the surface to a satisfactory sheen. Many coats were necessary, and must be periodically repeated in order to maintain the original gloss. As time went on it was noticed that various woods were darkening and becoming richer in color and harder in texture. Because of these results the method continued.

The Phoenicians, however, during the period of Alexander the Great, as the hardiest explorers and as commercial travelers were probably the most responsible for the introduction of fossil and semi-fossil gums to craftsmen of the age. Frankincense and myrrh were much in demand and in an effort to offer substitutes, fossil gums from Africa and India were put on the market. At this time the secret industry of gum melting and varnish making was begun and with the ignorance of the times many concoctions were compounded in order to develop a varnish clear and transparent which would be looked upon with favor by the Egyptian undertakers who desired the varnish for use in sealing the wrapping cloths and in finishing the coffins. Some one craftsman and his students was successful in developing a varnish of such wonderful clearness and durability that it was named after the Queen of the Phoenicians, "bernice" now changed to "varnish". This new substance was seized upon eagerly by the furniture craftsmen who realized, that here at last, was a material of great labor-saving and beauty. A jealously guarded secret, handed down from father to son, this varnish soon had its imitators but the origin of manipulation of the various materials is a lost art. Our present day varnishes last but a few years whereas the ancient materials lasted generations before failing to perform their duty of protecting and beautifying the surfaces they covered.

From time to time, however, refinements of rubbing and polishing were introduced, since it was early observed that the portions of furniture in constant contact with the hands gradually developed an even surface of even gloss. Fine abrasive materials as powdered pumice stone and rotten stone were in use for centuries as well as the practice of rubbing with felt and oil. Gradually this practice became obsolete and water rubbing replaced the harder method. Such surfaces, however, lacked the glow and depth of the oil rubbed work so that again the use of oil as a polishing material came into its own. Again, as in the days before varnishes were made, the various craftsmen developed strange and incomprehensible mixtures with which to rub their work. Oils, waxes, beers, ales, blood, eggs, vinegar, dust from powdered human bones and teeth, hair and other materials unmentionable found their way to the rubbing pads of these older day finishers. Gradually, however, the practice narrowed itself down to the use of mixtures of oils, waxes, vinegar, and one or two other materials. One formula in general use in English shops today consisted in boiling beeswax in potash water and beating to form an emulsion, but the material failed to do its work if the crude potash were excessive since it quickly attacked the varnish. Constant research for many years has shown me the fallacy of using the majority of the polishes now on the market. A very, very few have a few good points to recommend them. Most are bad, the greater majority are worthless or harmful in the extreme. Probably the greatest hoax on an unsuspecting public, that has been offered as a furniture polish is a nationally advertised clear oil polish, which is essentially a light bodied paraffine oil worth fifty cents a gallon and a very small amount of deodorant. It is of no permanent value as a polish.

The prime requisites of a good polish are these: First, it must contain a good cleaning agent in order to rid the varnish surface of its accumulated grime from hands and atmosphere. Second, it should contain materials capable of feeding the varnish with the proper vegetable oils, *not mineral,* in order to prolong its life, flexibility and delay cracking and silking. Third, it should have a good polishing agent in order to bring the varnish up to a full, hard, bright, hard gloss, free from greasiness and any tendency to collect dust. Lastly, it should be an emulsion in order that all materials may reach the varnish collectively. A polish which separates quickly, as do so many, does not perform its work properly since it is indicative of a poorly balanced formula, generally highly acid; a condition very injurious to a varnish film.

In many homes, furniture polishing is undertaken but once a year, during the upheaval of spring housecleaning. To be sure, this is a justifiable time following the accumulation of furnace gases and dusts not removable by ordinary dust cloth methods. This is quite wrong for good furniture should be polished once a month and a good piano more often. I earnestly recommend that piano cases be washed with the clear suds from *Ivory Soap* and a soft cloth or sponge. This will effectually remove the blue bloom from furnace gases and will clean up the ivory keys very nicely. Avoid a sponge with too much water. While the case is still wet, go over with the polish, using it freely. Wipe dry and polish to a hard, bright surface with a clean cheesecloth. Cloths should be washed out after use, with hot water and "gold dust," since they improve with frequent use and washing.

No furniture or auto finish will last long or maintain its brilliancy and luster unless the varnish be kept clean and polished frequently enough to get enough oil to keep the surface fed up and prevent premature hardening and drying. When a varnish film becomes completely oxidized or hardened it immediately begins to crack, silk and lose its luster. The function of the oil consists in delaying this final end point of exudation and filling the pores of the varnish.

Above all else avoid those snares and delusions which offer to clean and polish an auto without washing, by spraying on a film of oil. Such a method will scratch the finish beyond repair and in nearly all cases is sticky enough to cause road dust to adhere. There are no short cuts in polishing. Good results may not be accomplished without some labor even tho many misleading materials are offered with this argument advanced.

Briefly the best method of polishing is this:

1. Wring out a cheesecloth in water.
2. Pour on polish freely and rub over pad.
3. Rub surface to be polished thoroly. For carving use a stiff brush.
4. Wipe dry and hard with a clean, dry cheesecloth.

A COURSE IN AUTOMOBILE CONSTRUCTION, OPERATION AND REPAIR—III

Harry W. Anderson, Director, Automobile Department, U. S. Army Vocational School, Fort Sill, Okla.

Outline of a Course in Automobile Construction, Operation and Repair

COURSE OF STUDY.

Carburetion.

Function of carburetion. Mixing and generating valve.

Elementary principle of float feed or constant level type of carburetor.

Types of carburetors: plain tube, compensating jet, double stage metering pin, air valve. The correct mixture. Rich and lean mixture. Carburetor parts: throttle valve, speed control. Heating or vaporizing. Heat regulation methods. Temperature regulators. Inlet and exhaust manifolds. Study of hydrocarbons. Low and high gravity gasoline. Kerosene as fuel. Fuel troubles. Study and comparative tests of standard makes of carburetors: Holley, Kingston, Zenith, Schebler, Stromberg, Rayfield, Stewart. Definite rules for adjustment of respective carburetors. Trend in carburetor design.

Gasoline Feed Systems. (3GF.)

1. Gravity feed.
2. Pressure feed; parts of the representative system.
3. Vacuum feed: principle, parts. Study of Stewart and Sparton.

NOTES ON COURSE.

III. AUXILIARIES.

In introducing a study of carburetors show that gasoline must be mixed with air to become an explosive. (See Eng. Ext. Dept., Ia. State College Bulletin on Carburetors).

(Pratt, The Automobile Instructor, p. —), (Hobbs and Elliott, chapter IV).

Function of carburetor: To measure and proportion the gas and air, to mix the gas and air, to vaporize the gas. Bring this last point out in relation to the low grade of present day fuels in the discussion of preheating the charge.

Discuss the simplest type of mixing valves (Lunkerheimer as example). Then a simple float feed carburetor (see Dykes enc., p. —). Discuss Venturi.

Consider the makes in common use calling attention to the method by which they compensate at high speeds. (Consult the manufacturers' book freely.)

Cars using various makes:

1. Stromberg: Allen, Biddle, Cleveland, Dorris, Elgin, Grant, Hupmobile, etc.
2. Zenith: Chevrolet, Daniels, Hollier, Lorraine, Nelson, Noma, etc.
3. Marvel: Buick, Hanson, Moore, Nash, Oakland, Scripps-Booth, etc.
4. Rayfield: Anderson, Auburn, Chandler, Lexington, Moon, National, Reo, etc.
5. Johnson: Apperson, Cole, Maxwell, Olds 6 Premier, etc.
6. Carter: Commonwealth, Dort, Gardner, Spacke, etc.
7. Tillotson: Willys-Knight, Stephens, Pilot, Overland 4, Maibohm, etc.

TEACHING AIDS.

Fuels—H. & E., Figs. 79-80.

Motor Vehicles, Fig. 40.

Mixing Valve—Audel's Guide, Fig. 27; Pratt, Fig. 45; Dyke, p. 141.

Simple Carburetor — Page Questions and Answers, Fig. 63.

Teacher's outline, Fig. 13-1; Dyke, p. 144.

Zenith Chart No. 1.

Auxiliary Air Valves—Teacher's outline, Fig. 13-2, p. —; Q. & E., 67 and 71.

Audel's Guide, Fig. 31. *Venturi Tube*, Dyke, p. 152.

Manufacturers' charts:

Zenith, Nos. 1-4 inc., Master.
Stromberg—Van Dyke print.
Rayfield—Lerge, Marvel.
Stewart—Blueprint.
Obtain from mfrs. (gratis).

Tillotson (any full page ad. shows clearly).

Any other form of carburetor can be drawn from sectional views in books. Sectionalize or borrow sectional carburetor gasoline systems.

Gasoline Feed Systems.

Motor, Jan., 1920, p. 97.

Audel's Guide, p. 56a.

Motor Vehicles, Figs. 36-37-38-39.

H. & E., Figs. 117-120 inc.

Stewart Vacuum Feed booklets (gratis).

(*Continued from Preceding Column*)

8. Kingston: Ford.
9. Newcomb: Holmes.
10. Ball & Ball; King, Locomobile, Mercer, Peerless, Olds 8, Studebaker EG, etc.
11. Schebler: R. & V. Knight, Stearns Knight.
12. Scoe: Briscoe.

COURSE OF STUDY.	NOTES ON COURSE. (Carburetion Concluded.)	TEACHING AIDS.
13. Stewart: Dodge. Cars using their own make: Cadillac, Essex, Franklin, Hudson, Phianna, Pierce-Arrow, Packard. (Consult instruction book furnished with these cars for complete information.) Discuss preheating the charge and the fuel situation.	Formulate rules for correctly adjusting each make of carburetor. (Consult mfrs. booklets and Motor Age for May 6-27.) Have a set of rules duplicated so that each member of the class can have one. In general state that gas adjustment comes first and air compensating adjustment later, also that engine should be thoroly warmed up before attempting to adjust carburetor.	
Ignition. Fundamentals of electricity and definitions. Direct and alternating current. Dry batteries, series and parallel connections. Battery connections for ignition purposes. Simple single cyl. battery ignition system. Three terminal coil. Timers, spark plug, switches, master vibrators. High tension distributor system. Connecticut, Remy, Atwater-Kent, Westinghouse, Delco. Spark advance and retard. Automatic spark advance. Principles of magnetism. Mechanical generation of current. Low tension magnetos, high tension magnetos. Shuttle armature and rotor or inductor types. Remy, Mea, Eisemann, Berling, Bosch, K. W., Dixie, Ford type, Kingston. Impulse starters, magneto speeds. Timing magneto. Comparison between battery and magneto ignition.	A study of Ignition will start with magnetism and elementary electricity reduced to the simplest terms. The use of a science text at this point is recommended. A little bell and buzzer wiring can be demonstrated to advantage to illustrate open and closed circuits, etc. The bell and buzzer can also be used to illustrate the principle of the vibrator on a spark coil. Tin foil can be used to illustrate the fuse. After a study of elements of electricity show simple jump spark system on single cylinder engine using wipe contact timer. Make close study of various battery systems from many manufacturers' booklets. In studying magneto obtain several telephone magnetos from local telephone companies.	Charts for Elementary Magnetism and Electricity. H. & E., Figs. 145-172 inc. Dyke, pp. 206-226. Motor Vehicles, Figs. 109-113. *Electrical Symbols.* *Batteries, Wiring Storage Batteries*—Phillips' book. Motor Vehicles, Figs. 98-108 inc. *Simple Jump Spark Systems.* Dyke, p. 218. Pratt, Fig. 59. H. & E., Figs. 174-176-177-178-180. Battery systems. Obtain from manufacturers' booklets. *Magnetos—Low Tension.* Page —, Q. & E., Fig. 105. Motor Vehicles, Figs. 140-141. *Magnetos—High Tension* Mnfrs. charts—Dixie, Bosch, Eisemann. Motor Vehicles, Figs. 143-144-146-147-148-160-161-162-164-166-171.
Starting and Lighting System. Starting on spark. Starters: Air, mechanical, acetylene, electric. Single unit, two unit and three unit systems. The generator, motor and battery; parts, construction, series and shunt winding. Shuttle and drum armature. Motor starting and motor drive. Sliding direct pinion, Bendix drive, reduction gear and sliding pinion, reduction gear and chain, chain worm and chain. Bijur drive. Single and two wire systems. Starting switches: Foot operated, push button, magnetically operated, automatic pinion shift. Generators. Current regulation: magnetic principle thermal system, centrifugal governor, bucking coil, variable resistance. Third brush system. Study of wiring systems.	See Hobbs and Elliott and Dykes Ency. for complete discussion of starting and lighting systems. Make extensive study of one two-unit system and of typical single unit motor and generator. Pay particular attention to current regulation. Trace out several complete wiring diagrams on cars in shop. Make each student draw each one of the diagrams. Consult manufacturers' service book freely. See Manly, "Automobile Starting and Lighting Systems."	*Starting and Lighting Systems.* Manufacturers' service books. Dykes, H. & E., pp. 265-331 inc., Pratt. Motor Vehicles, pp. 213-230. Show Bendix Drive on car in shop. Obtain Bendix drive. Draw several typical wiring diagrams on piece of wallboard 26″ x 48″. Low tension circuit, black-heavy; H. T., red.
Storage Batteries. General description. Meaning of amperes and volts. Construction element positive and negative plates. Composition, glossary of terms. Action of storage battery during charge and discharge, voltmeter. Care of storage batteries. Charging rates. Study of batteries. Vesta, Willard, Exide, Philadelphia, U. S. L. The Edison battery. Construction, electrolyte, principle.	Make use of the Willard and Exide manuals in studying storage batteries. If possible construct a one-cell battery in the shop. Make simple wooden mould. Phillips—Discussion of Batteries, p. 45,	Borrow wall display and sectional storage battery from battery service station. Obtain service plates from battery ruined thru freezing, overcharging, deterioration, etc. Mount on wallboard. Make hydrometer tests. Cadmium test if you have the instruments at hand. Phillips—Simple Experiments, pp. 45-49 inc.
Driving. Preparing car for road—Filling tank with gasoline, oil reservoirs, radiators, inspecting tires and car. Before starting motor see that: gears are in neutral, brakes set, spark retarded. Dash control or choke. If cranking note correct way to crank, pull up with thumb alongside fingers. Engine started, to start car: 1. Brake off, hold car with foot brake if necessary. 2. Put transmission in low, let clutch in easy, release foot brakes. 3. Change to second and high, each time letting clutch out and easing upon foot throttle. Avoid clash-	**IV. OPERATION.** Demonstrate all points about driving. Show why must in low gear. (By torque diagram showing relation between engine power at high speed and power required to start car moving. Discuss inertia and momentum.) Discuss necessity for easing up on throttle when changing to higher gear. Also necessity for speeding engine slightly when changing to lower gear. Discuss local city and state laws. If school has athletic field close by use it for driving field. It furnishes a	A. Start of driving. Jack up rear of car on blocks and go thru gear shift, etc. With car jacked up. Have one or two driving cars as part of equipment. Appoint boys in class who drive well to take charge of instruction on track. *(Concluded from Preceding Column)* suitable place and relieves the instructor of the worry attendant with taking green drivers out on city streets. Conduct class automobile hikes if enough boys in the class have cars. Consult Dykes Ency. for rules of the road.

ing of gears or violent clutch action.
4. Reversing.

Handling car on road:

1. Must be alert. Self control. Keep to the right side of the road. At intersections watch for cars coming from the right.
2. Keep spark well advanced, as far advanced as possible without causing to knock.
3. Use foot throttle. Keep hand throttle away back on quadrant.

COURSE OF STUDY—Driving Concluded

4. Retard spark on hard pull. Go in to lower gear as soon as engine shows signs of laboring.
5. Speed. Drive consistently. High speed racks the car.
6. Gear shifting on road.
   a. Change gears in bad spots to lower gear.
   b. Use highest possible gear.
   c. In shifting to lower gear, speed engine slightly while making change.
   d. Starting on hill or upgrade.
7. Always have car under control.
   a. Use engine as brake either with, or without engine running. Engine acts as air compressor when not running.
   b. Use foot and handbrakes alternately.
   c. Roll up to stops.

Leaving car.

1. Spark and throttle levers way back on quadrant.
2. Gears in neutral.
3. Emergency brake locked.
4. If any thief-proof locks on car, lock same.

COURSE OF STUDY.	NOTES ON COURSE.	TEACHING AIDS.
Trouble Shooting (See Lecture Outline).	See lecture outline on trouble shooting. Vacuum Oil Co.'s booklets. H. & E., pp.—.	(See Laboration outline.) Have old engine on block as equipment for laboratory work. Get as many different types of engine as possible. Also varied equipment of carburetors and magnetos, etc.

(*Concluded from Preceding Column*)

1. Definition or explanation of troubles. Classes of troubles: carburetion, ignition, cooling system, mechanical.
2. Carburetion troubles. Review of principles of carburetion. Ideal mixture, gasoline and air proportioning at high speed. Symptoms of rich mixture. Causes of rich mixture: a. Too much gasoline fed to carburetor. b. Too much gasoline fed thru the carburetor. c. Too much gasoline fed to the cylinders. Remedies and adjustments.
   Symptoms of lean mixture. Causes of lean mixture: a. Too little gas fed to the carburetor. b. Too little gas fed thru the carburetor. c. Air leaks.
   Remedies and adjustments: Rules for correct adjustment of carburetors. Gasoline feed system troubles. Remedies.
   Analogy of external and internal combustion engines. Loss of heat values in incomplete combustion.
   Discussion of summer and winter adjustments.
3. Ignition troubles. Review of ignition system in use. Ignition as a source of trouble. Causes of ignition troubles: a. Battery troubles. b. Terminals. c. Open circuit wires. d. Contact breaker or commutator. (Note difference: Contact breaker is an interrupter; commutator can also be called timer.) e. Distributor. f. Magneto. g. Coil. h. Condenser. i. Switch, etc.
   Remedies and adjustments. Rules for timing.
4. Cooling system troubles. Causes. Remedies.
5. Mechanical troubles. Symptoms. Remedies.

Minor Repairs. Service lubrication. Review of lubrication—Engine chassis, etc. Study of lubrication charts.	Emphasis again on necessity for watching lubrication needs of car closely. This should clinch student's previous study of lubrication.	Page —, Charts on engine troubles. Vacuum Oil Co.'s booklets. Every car which comes in shop should be lubricated at all points. Even springs very necessary.

List of Textbooks.

1. The Gasoline Automobile, Hobbs & Elliott, Mc-Graw-Hill Book Co., New York.
2. The Automobile Instructor, Clyde H. Pratt, Cleveland Automobile School, Cleveland, Ohio.
3. Motor Vehicles, Fraser & Jones, D. Van Nostrand Co., New York.
4. Dyke's Encyclopedia of the Automobile, A. L. Dyke. A. L. Dyke, Publisher, St. Louis, Mo.

Reference Books.

Automobile Repairing Made Easy—Page.
The Modern Gasoline Automobile—Page.
Modern Starting, Lighting and Ignition Systems—Page.
Questions and Answers on Motor Car Construction, Operation and Repair Page. Norman W. Henley Publishing Co., New York.
Information: Elementary Electricity, Motor Car Electric Systems, Gas Engine Applied to the Motor Car—Phillips. Published by the author.
Ignition, Timing and Valve Setting—Russell & Rathbun. Stanton & Van Vliet Co., Chicago, Ill.
Homan's Automobile Handbook.
Audel's Automobile Guide, Audel & Co., New York.
The Automobile Book — Duryea & Homans. Sturgis & Walton, New York.
Automobile Catechism and Repair Manual—Swingle and Tarantous. Frederick J. Drake Co., Chicago, Ill.
Electric Lighting and Starting for Motor Cars—Cross.
Automotive Wiring Manual.
Automobile Repairmen's Helper—S. T. Williams.
Electric Starting and Lighting Troubles Boiled Down, U. P. C. Book Co., New York.
Wiring Diagrams, Michigan State Automobile School, Detroit, Mich.
Care and Operation of Automobiles—M. A. Hall. American School of Correspondence, Chicago, Ill.
Automobile Ignition, Starting and Lighting—M. A. Hall.
Automobile Construction and Repair—M. A. Hall. American Technical Society, Chicago. Ill.
Automobile Engineering—6 Volumes. American Technical Society, Chicago, Ill.
Ford Standard Electrical Equipment. American Bureau of Engineering, 1603 S. Michigan Ave., Chicago, Ill.
Engelman's Autocraft.
Ford Textbook—E. F. Hallock.
Motor Query Encyclopedia.
Starting and Lighting Systems of Automobiles—Hallock.
Oxy-Acetylene Welding. American Automobile Digest, Cincinnati, Ohio.

Gas Engines.

Gas, Gasoline and Oil Engines—Hiscox & Page. Norman W. Henley Publishing Co., New York.

Automobile Magazines.

Motor Age.
Motor.
Motor Life.
Automotive Industries.
Commercial Vehicles.
American Automobile Digest.
Automobile Trade Journal.
The Motorist.
Automobile Dealer and Repairman.
Ford Owner and Dealer.
Popular Science.
Popular Mechanics.
Motor World.

Classification of Work in Auto Repair Work.

The object of making this classification is to definitely place all work coming into the shops at the school in order to aid in the expedient handling of all classes of repair work which may be undertaken.

The work to be undertaken will fall mainly in two classes:

1. When a general overhaul of the whole vehicle is undertaken, ultimately requiring the services of all divisions.

2. Where the work to be done will require the services of only one or two of the divisions. This latter class of work should be that which in the judgment of the instructor will not require more than three or four hours at the most to complete as here outlined.

There are five different shops or five different places where work can be done. Each shop should have a definite part of the whole work to perform and this should be done with as little delay as is consistent with first class repair work.

The five shops or divisions are: 1, chassis; 2, engines; 3, auxiliaries, embracing ignition repair, starting and lighting repair, storage repair, carburetor repair; 4, operation; 5, machine shop.

The work to be done has arbitrarily been divided into five groups. The distinguished features being the nature of the work and also the time required to do this work.

Chassis Division.

The work to be done by the chassis division may be divided into two classes, that where only some small repair is made to some part of the car, such as, repairs not covered by the operation division.

In case of a general overhauling the component parts of the vehicle are to be sent to the respective shops for overhaul of these parts. The work may be detailed as follows:

General overhaul, sending engine to engines division, ignition, carburetor and starting and lighting equipment to the auxiliaries division.

Miscellaneous small repairs, chains, drive, changing wheels, changing springs, changing axles, exchanging axles, front straightening body, minor repairs to bearings, wheel changing or adjusting brake bands, relining clutches, adjusting radiators, exchanging rods, front tie, straightening. Spring bolts and springs replaced. Spring, shackels repairing and exchanging. Steering column, repair to steering gear. Repair to tires, pneumatic. Repairing frames. Transmissions, repair and adjustment. Spokes, tightening. Bodies, rebuilding and repairing. Bodies repainted.

The Engine Division: The engine division should make all repairs to engines where the whole unit is taken out of the chasis and delivered to that division. Carbon burning and scraping will also be done in this division. Some of the jobs done are detailed below:

Engine general overhaul.
Replacing worn parts.
Carbon removing by scraping or burning cylinder blocks.
Grinding lapping or reaming cylinders and fitting pistons.
Replacing piston rings.
Fitting in new and lapping parts.
Replacing or repairing.
Truing crank shafts.

Repair work in the auxiliaries division. The repair work in the auxiliaries division should consist of repairs to any piece of the ignition, carburetor or starting and lighting systems. In addition to this, radiator repairs can be included in the work of this division. The work may be summarized as follows:

Batteries, storage, refilled, testing and charging.
Carburetor repairing.
Gasoline line and tank repairs.
Vacuum tank repairs and adjustments.
Ignition wires.
Horn wires and adjustment of horn.
Overhauling and recharging magnetos.
Starting and lighting overhauling and repair.
Radiator repair.

Operation division: The work in the operation division shall consist of such minor adjustments which will require only a short time to complete, not over three or four hours at the most. Such work being necessary to keeping the car in service and only work where the parts are not to be removed from the vehicle; in addition to this all general inspection work comes under this division. A list of operations which come under this division follows:

Inspection general.
Brake rod adjustment.
Batteries, filling.
Carburetor adjustment.
Contacts, cleaning and refitting of:
Differentials, greasing of fan belts, adjusting and installing.
Magneto adjustment, minor magneto points and brushes, adjustment of:
Plugs, spark, cleaning of parts, loose, tightening of:
Radiator cleaning.
Dynamos, changing.
Inspection, periodical general tightening up.
Storage batteries, testing.
Storage batteries, exchanging.
Starting and lighting equipment.
Minor adjustments and testing.
Fenders, removing.
Fenders, straightening (minor dents).
Radiator, cleaning.
Transmission, greasing.
Plugs, spark, changing.
Valve tappet adjustment.
Bearings, taking up on main and connecting rods.
Bearings, where this work can be done without pulling the motor.
Lights, head and side, inspection and repairing.
Motors, tuning up.
Magnetos, exchanging.
Pumps, packing.
Radiator hose, replacing.
Compression cocks, replacing.

Machine Shop Division: The machine shop should make any such repairs as may be required by any of the other divisions and in general this will include:

Machine work.
Oxy-acetyline welding.
Blacksmith work, and may be detailed in part as follows:
Bushings, small, making frames, welding.
Cylinder blocks, welding.
Cylinder blocks, reboring of bearings, pouring and boring of:
Pistons, manufacture of standard, oversized.
Shaft, truing and turning of:
Crank-cases, welding.
Fenders, repairing.
Radiator, repairs.

TROUBLE SHOOTING LABORATORY OUTLINE.

I. LABORATORY (2 hours).

Explain oiling and cooling system (to emphasize lubrication).
Types of oiling systems.
Types and locations of oil pumps.
By-pass valve and adjustments.
Oil level gauge.
Oil pressure gauge.

Types of cooling systems.

Difference between pump and thermo-syphon system.
Caution about sediment or foreign matter in radiator.

Explain Carburetor.

Difference between plain-tube, double-jet and multiple-jet carburetor.
Adjustments on carburetor.
Have students practice adjustments.
Familiarize them with the difference between rich and lean mixture.

II. LABORATORY (4 hours). GENERAL WORK ON ENGINES ON THE BLOCK.

Explain adjustment of particular carburetor on the engine.

Explain gravity, pressure and vacuum feed.

Explain ignition system in use on the particular block at which the group is working.

Laboratory exercises.

Simple carburetor and gasoline feed system trouble.

III. LABORATORY (2 hours).

Explain carburetor and ignition system on his blocks.

Explain timing of ignition.

IV. LABORATORY (2 hours).

Ignition systems.

Explain carburetor and ignition on blocks.

V. LABORATORY (3 hours).

Simple ignition trouble.

Trace ignition system for trouble.

Outline systematic method of procedure in tracing trouble.

Laboratory exercises.

Simple ignition and carburetor troubles.

VI. LABORATORY (3 hours).

Valve timing and setting.

Magneto timing.

Valve tappet adjustment.

Trouble locating in same.

VII. LABORATORY (2 hours).

Practical trouble shooting.

Ignition and carburetor trouble with combinations of same.

VIII. LABORATORY (4 hours) ON CARS.

Valve trouble ignition and carburetor trouble on some car in shop.

IX. LABORATORY (4 hours).

Practical trouble shooting.

Hidden troubles, defective carburetors and magnetos.

LIST OF LABORATORY EXERCISES FOR TROUBLE SHOOTING, OPERATION DIVISION, ON MOTOR EQUIPMENT IN SHOP.

I. Carburetion.

A. STROMBERG CARBURETOR.

1. Stop gas line gap on float piece of waste or lint.
2. Close choke.
3. Cut off gas at tank.
4. Screw slow speed adjustment in or out.
5. Screw high speed adjustment in or out.
6. Stop up air bleeder with match stick in hole cut off smooth.
7. Loosen carburetor flange.
8. Hold down float.
9. Raise float.
10. Stop up idle discharge jet.
11. Loosen lever on air horn.
12. Leave air valve without control.
13. Take out throttle valve screw to leave throttle valve without control.
14. Stop up accelerating well.
15. Put water in carburetor.
16. Disconnect gas line at carburetor.
17. Loosen intake manifold.

B. SCHEBLER CARBURETOR.

1. Hold float down.
2. Hold float up.
3. Open dash adjustment.
4. Stop gas line.
5. Screw down low speed adjustment.
6. Screw up low speed adjustment.
7. Remove air valve spring.
8. Reverse air valve spring.
9. Put water in carburetor.
10. Loosen carburetor flange causing air leak.

C.—ZENITH CARBURETOR.

1. Make necessary changes for rich and lean mixture.
   (a) Jets.
   (b) Venturi tube.
2. Loosen carburetor flange.
3. Loosen intake manifold.
4. Stop gas line.
5. Water in carburetor.
6. Change float level.

Gasoline Feed Systems.

A. GRAVITY FEED.

1. Make tank air-bound by closing wall air vent in cover.
2. Place tank low in relation to carburetor.

B. PRESSURE FEED.

1. Remove fuel tank filler cap.
2. Loosen pressure pipe connection.

C. VACUUM FEED.

1. Change gas vacuum line at tank.
2. Stop up air vent.
3. Close flapper valve.
4. Open flapper valve.
5. Hold float down.
6. Hold gas valve open.
7. Hold air valve open.
8. Stop gasoline from tank.
9. Stop vacuum line to manifold.
10. Stop gas line from carburetor.
11. Loosen screws on top of vacuum tank.
12. Puncture float.
13. Weight float.
14. Loosen vacuum line.

3. IGNITION.

A. BOSCH HIGH TENSION MAGNETO.

1. Change timing.
2. Change wires.
3. Use Simms-Bosch breaker cover on Bosch.
4. Short circuit breaker points.
5. Open circuit breaker points.
6. Remove carbon pencil (H. T.)
7. Short safety gap.
8. Remove collector ring.
9. Short circuit collector brush with fine wire.
10. Put in open circuited (H. T.) wires.
11. Ground switch connection on magneto terminal (primary).
12. Short distributor block with soft lead pencil marks from segment to segment.
13. Shift breaker points till spring touches ground.
14. Points too far apart.
15. Grease distributor brush and block.
16. Foul collector brush.
17. Foul plugs with library paste or dirty oil and powdered graphite.

Magneto Changes (Made on Special Magnetos Reserved for the Purpose.)

1. Change timing distributor gear.
2. Change magneto (reverse one.)
3. Change contact breaker.
   (a) Insulation taken out.
   (b) Change uni-sparker.
4. Change magneto from clockwise to anti-clockwise and vice versa.
5. Weak magneto.
6. Hard-rubber brushes.

B. REMY BATTERY IGNITION SYSTEM.

1. Change timing.
2. Shellac points or use thick rubber cement or rubberstock.
3. Open points.
4. Close points.
5. Change spark plug wires around.
6. Insulate side of primary ground with loosening spring on brush.
7. Insulate around wire.
8. Ground battery lead.
9. Ground condenser.
10. Crossed wires to plugs.

C. ATWATER KENT SYSTEM.

1. Short circuit condenser (not advisable. Could be done on one special interrupter reserved for the purpose.)
2. Open circuit condenser.
3. Close breaker points.
4. Insulate breaker points.
5. Ground H. T. terminal with fine wire.
6. Change timing.
7. Put in open circuit or broken wires.
8. Close spark plug gaps.
9. Open spark plug gaps.
10. Drive pin or needle in wire to short them.
11. Broken wires.
12. Chafed wires to cause shorts.

13. Make magneto interrupter lever stick so it doesn't move freely.

14. Take off back of ground terminal on stationary block and put on brass washer.

4. Cooling System.

A. TO MAKE ENGINE OVERHEAT.

1. Set spark late.
2. Obstruct water circulation.
3. Lower water in radiator (if thermosyphon.)
4. Obstruct exhaust.
5. Late exhaust valve opening.
6. Rich mixture with spark retarded.

B. Changes to Be Made on Engine.

1. Weak exhaust valve spring.
2. Small washer between tappet and valve stem.
3. Loosen connecting rod cap bolts slightly to illustrate connecting rod knock.

(To be continued)

HOW TO RETAIN THE BARK ON LOGS USED IN RUSTIC CONSTRUCTION.

For preventing the bark from flaking off logs used in rustic structures, the Forest Products Laboratory, Madison, Wis., recommends the following methods of seasoning and preparing the timbers as the most effectual:

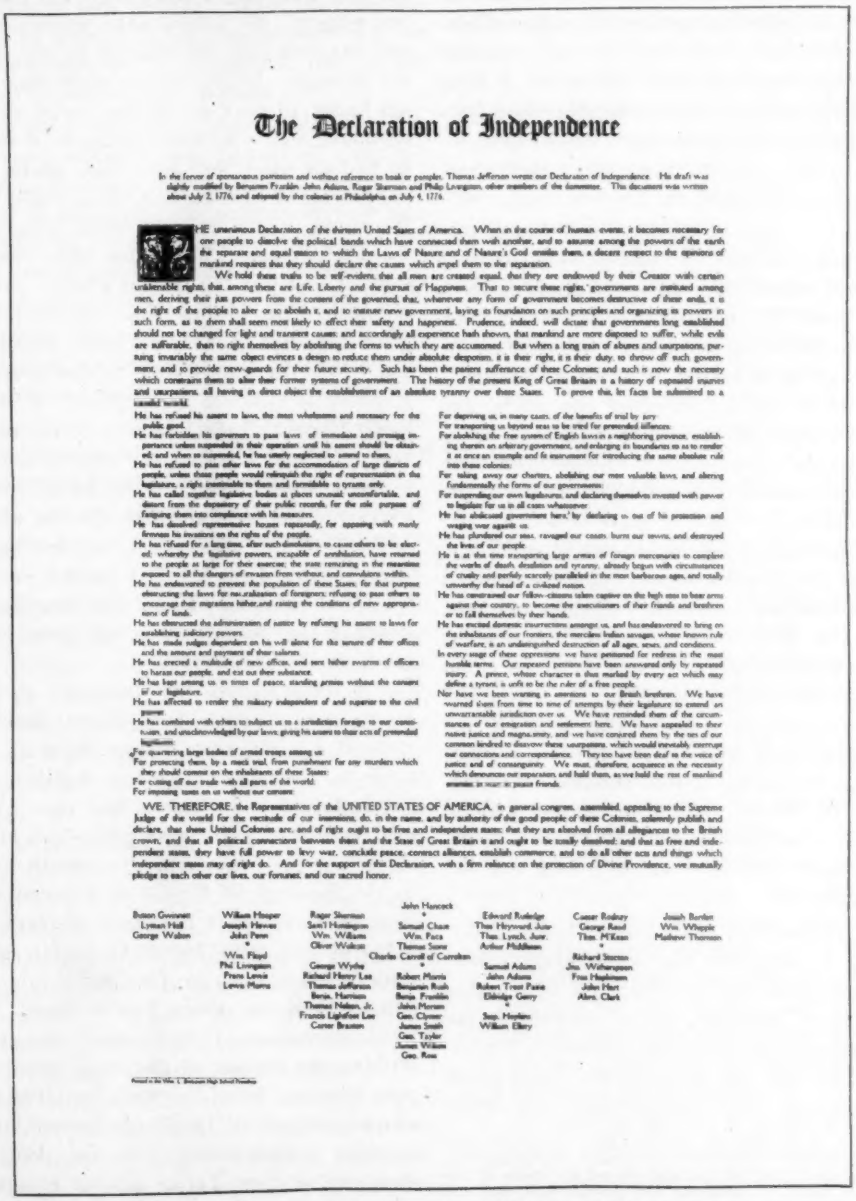
(1) Cut timbers late in summer and score on two sides; that is, cut off narrow strips of bark for the entire length. Pile in shade in open pile to allow thoro circulation of air. Allow timbers to season until following spring or summer before using.

(2) Proceed as in (1), and in addition coat ends, stripped portions, and knots with coal-tar creosote, using one coat a few days after timber is cut and another just before using the timbers.

(3) Proceed as in (1), but do not score bark. When timbers are in place, tack bark on with large-headed nails, placing one to every square foot of surface. Paint heads of nails to resemble color of bark.

(4) Tack or nail the bark on without particular attention to time of cutting or other treatment.

The nailing method has been used successfully by one western company which maintains numerous rustic hotels, and also on a large rustic building erected for exposition purposes.



The Declaration of Independence

In the fervor of spontaneous expression and without reference to book or pamphlet, Thomas Jefferson wrote our Declaration of Independence. His draft was slightly modified by Benjamin Franklin, John Adams, Roger Sherman and Philip Livingston, other members of the committee. This document was written about July 2, 1776, and adopted by the colonies at Philadelphia on July 4, 1776.

THE unanimous Declaration of the thirteen United States of America. When in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed, that, whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute new government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former systems of government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world.

He has refused his assent to laws, the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance unless suspended in their operation until his assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

He has refused for a long time, after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the state remaining in the meantime exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose obstructing the laws for naturalization of foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone for the tenure of their offices and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers to harass our people, and eat out their substance.

He has kept among us, in times of peace, standing armies without the consent of our legislature.

He has affected to render the military independent of and superior to the civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us:

For protecting them, by a mock trial, from punishment for any murders which they should commit on the inhabitants of these States:

For cutting off our trade with all parts of the world.

For imposing taxes on us without our consent.

For depriving us, in many cases, of the benefits of trial by jury.

For transporting us beyond seas to be tried for pretended offences.

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies:

For taking away our charters, abolishing our most valuable laws, and altering fundamentally the forms of our governments:

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated government here, by declaring us out of his protection and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large armies of foreign mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens taken captive on the high seas to bear arms against their country, to become the executioners of their friends and brethren or to fall themselves by their hands.

He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms. Our repeated petitions have been answered only by repeated injury. A prince, whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

Nor have we been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them, as we hold the rest of mankind enemies in war: in peace friends.

WE, THEREFORE, the Representatives of the UNITED STATES OF AMERICA, in general congress, assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the name, and by authority of the good people of these Colonies, solemnly publish and declare, that these United Colonies are, and of right ought to be free and independent states; that they are absolved from all allegiance to the British crown, and that all political connection between them and the State of Great Britain is and ought to be totally dissolved; and that as free and independent states, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent states may of right do. And for the support of this Declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our lives, our fortunes, and our sacred honor.

John Hancock

Button Gwinnett, Lyman Hall, George Walton
William Hooper, Joseph Hewes, John Penn
Wm. Floyd, Phil. Livingston, Frans. Lewis, Lewis Morris
Roger Sherman, Sam'l Huntington, Wm. Williams, Oliver Wolcott
George Wythe, Richard Henry Lee, Thomas Jefferson, Benja. Harrison, Thomas Nelson, Jr., Francis Lightfoot Lee, Carter Braxton
Samuel Chase, Wm. Paca, Thomas Stone, Charles Carroll of Carrollton
Robert Morris, Benjamin Rush, Benja. Franklin, John Morton, Geo. Clymer, James Smith, Geo. Taylor, James Wilson, Geo. Ross
Edward Rutledge, Thos. Heyward, Junr., Thos. Lynch, Junr., Arthur Middleton
Samuel Adams, John Adams, Robert Treat Paine, Elbridge Gerry
Step. Hopkins, William Ellery
Caesar Rodney, George Read, Thos. M'Kean
Richard Stockton, Jno. Witherspoon, Fras. Hopkinson, John Hart, Abra. Clark
Josiah Bartlett, Wm. Whipple, Matthew Thornton

Printed in the Wm. L. Dickinson High School Printshop

PRINTING CLASS REPRODUCES DECLARATION OF INDEPENDENCE.

The print shop of the Wm. L. Dickinson High School, Jersey City, N. J., has recently reproduced the Declaration of Independence in a very suitable manner for framing and for hanging in the classrooms of the city. The document is reproduced on a sheet of high-grade stock 15x20 inches in size and the initial letter is hand-colored.

DEVELOPING A CLASS PROJECT

Mary E. Towne, Brookline, Mass.

THE question was asked, "How did the rope project come about?" If I were to answer briefly, I would say: "Naturally and spontaneously." It was the outgrowth of a sixth grade history lesson, while studying the industries of New England in the Colonial days. To supplement the textbook, I used a collection of pamphlets, issued by a banking firm in Boston, which gave a brief but most interesting account of the beginning and expansion of the leading industries from the very early days to the present time. One of the pamphlets gave an historical sketch of rope making in New England since 1828, and showed the expansion of the trade, and its present commercial value. There were quaint illustrations of the first rope-walks and the site of the original locations. Our discussions of these locations and great business transformations which have since taken place brought out several facts of local interest, but of greater benefit than the acquiring of these facts was the evolution of the project.

It was hatched right in the middle of the discussion. One boy asked what rope was made of. Another asked what hemp looked like. The only available piece of rope in the room was the window cord. As the rope is old, the unravelled ends furnished a good example for observation. A group of boys went to the windows and examined the cords. They observed the fibers, the number of strands, and the method of binding them together. They noticed also, that new window cords were made of a cotton material, thus calling attention to the fact that a substitute was used in place of hemp. Another pupil volunteered the information that a cordage factory was near the schoolhouse, and that he would call on his way home and ask for samples of hemp and rope. He would ask also if the class could visit the factory. The following morning the volunteer and his chum came to my desk with several specimens of hemp, and reported that the manager would permit eight or ten boys, accompanied by a teacher, to visit the cordage works and watch the process of rope making. We gladly accepted the invitation. Within a week we went to the factory and came back laden with several specimens and much valuable information gained thru observation and questions.

In reviewing the sixth grade history lesson, a discussion arose as to the reason why rope-making was of so much importance to the colonists; and why parliament and the local assembly offered rewards to encourage the raising of hemp in New England. We discovered how closely the rope industry was allied to the leading occupations of that time, namely, ship building and fishing. We learned, too, that the only rope-walk now in use, which dates back to colonial days, is at the Boston Navy Yard, Charlestown, Mass. At this point, one of the wide-awake boys asked: "Why can't we write to the commander and get some samples, and some information about the industry?" To suggest is to do, whenever possible.

The writer, too, had an inspiration! An exhibition for the Eastern Arts Association was hovering in my imagination. Why not use this very project?

I proposed the plan to the boys who became quite enthusiastic, and suggested that we would need to send our letters at once in order to get our materials in time. Accordingly, the letters were written that very day, and the best one was selected by the class to convey the message. In due time a reply came from Lieutenant Larew, of the Construction Corps, which stated that he would supply us with specimens of such material as he had on hand, and also, some photographs showing the process of rope making, if we would send for them. He would need a week, at least, to develop and print the photographs. When this letter was read to the class, it had just the desired effect I had hoped to accomplish. Up to this time, the seventh and eighth grade boys had shown very little interest in the problem. Now the wind shifted in that quarter. Here was a chance to visit the Navy Yard! Who would be the lucky fellow? Lieut. Larew's letter required an answer. "Would I permit the seventh and eighth grades to thank him?" Never in my memory have I received a set of letters from an entire class in which there were so few errors in punctuation and spelling. This point alone convinced me that the project was worth all the trouble it entailed. From this time on there was no stopping the flood. The ideas grew, the enthusiasm grew, the collection grew.

A seventh grade boy discovered an interesting account in a reference book of rope-making in Egypt, 2,000 B. C. He wrote a story about it. He drew pictures to illustrate his story. Another seventh grade boy had read how painters test rope. The story was read to the class, the result of which brought forth a set of compositions from the seventh grade. A visit to the Museum of Fine Arts revealed a specimen of rope, made in Egypt thousands of years ago, from the fibers of the palm tree. An eighth grade boy had come across a story in The Dutch Boy Magazine, entitled, "From the Abaca Tree to Rope," which he read to his classmates. It was a most interesting article describing the method of procuring hemp in the Philippine Islands. From this story we obtained another set of compositions. A friend who became interested in our problem communicated with the American Cordage Company of New York. To our surprise and enjoyment, a large package was sent to us containing samples

Editor's Note: A project on the subject of "rope" was evolved in a prevocational class of boys, grades six, seven, and eight. The following article interestingly shows the steps in the unfoldment of the plan. It suggests the possibilities that are present in many class and shop projects, if teachers will only develop the information and the material that is close at hand.

of hemp, a great many varieties of rope, a dozen magazines containing interesting items about the rope industry, and much valuable information regarding the method of treating hemp, and the uses of rope and cordage. This same friend took two of the sixth grade boys to visit a wholesale house in which they saw the method of testing rope and the way in which rope is handled on a large scale. When the boys returned to the classroom they gave a fine account of their visit to their classmates.

At the end of ten days, an eighth grade pupil went to the Navy Yard and brought back samples of American, Philippine and Mexican hemp, (sisal)—also specimens of at least ten dozen varieties of rope and cordage—and nine splendid photographs with a detailed description of each picture. Again the class was entertained by an account of the experiences which the messenger encountered on his memorable visit to one of Uncle Sam's important naval stations.

The paint shop instructor made a drawing of a painter's-fall, and explained the method of attaching the strands of rope when painting a house. He taught us the method of estimating the amount of rope necessary for a fall, and the cost at the current price. On this basis we worked many problems in arithmetic, involving common and decimal fractions and percentage.

In geography the sixth and seventh grade boys searched magazines and encyclopedias to find out the chief hemp producing countries and the conditions conducive to its growth. They drew maps showing the regions of production and other maps to show the shipping centers and routes of transportation.

As to the real educational value of the project, let me sum up a few of the experiences gained by its development.

I. Experiences which broaden life:

1. A group of ten boys witnessed the actual process of rope making and thus gained a first hand knowledge of the business. We saw one machine twisting a two-ply rope, another twisting a three-ply rope, and another a 24-ply rope. At this factory the firm buys old hawsers, and discarded rope which it converts into new rope. We saw the employees untwisting the outer strands of an old hawser, which were badly worn, and revealing the heart of the rope clean and strong. These inner strands were wound on bobbins, and made ready for the twisting machines. We discovered in one corner of the building a pile of dirty hemp. "Will you throw that away?" asked one of the boys. "Oh, no," replied the overseer. "We pack the refuse in bales and send it to a factory in which it is converted into paper." Here was an example in thrift, emphasizing the fact that in modern business methods there is practically no waste. This visit brought forth the contrast between the ancient and modern methods of making rope, especially the vast difference between the primitive machines and the complex types of today.

2. We handled several varieties of hemp.

3. We discovered a great many substitutes for hemp.

4. We learned how to detect a good quality of hemp from an inferior grade.

5. We learned to splice rope and to make a practical application of the knowledge.

6. From the samples we received from the Navy Yard, we became familiar with common nautical terms.

7. We learned to recognize oakum, to understand its value in the trades and the method of application.

8. We learned to make a square knot and other practical knots.

The boys gained confidence in interviewing business firms.

Two of the boys visited a wholesale firm and saw the method of handling and shipping rope on a large scale.

A visit to the Navy Yard gave a wide and interesting experience to an eighth grade pupil.

We were impressed by the importance of such a seemingly unimportant article. By actual count several pupils had records of 44 industries in which rope is an essential article.

Who can judge of the effect of our visit to the Museum of Fine Arts? For three hours we reveled in the wonders of life among the people of ancient Egypt. The boys were eager for information, and turned away reluctantly when our time was up.

II. The acquisition of academic knowledge:

1. In English, we added to our vocabulary at least 25 new words.

2. We increased our spelling list by 50 words.

3. We wrote four business letters which were sent to firms, or people who had given us aid, or, to request some favor.

4. We wrote six sets of compositions on subjects closely allied to the rope industry.

5. We had many oral discussions regarding kinds of hemp, rope, cordage, etc., noting the quality, the substitutes, the uses.

6. In geography and history we learned many facts of local interest.

7. We marvelled at the revelation that the first rope-walk in Boston was only ten feet long and ten inches wide, thus limiting the length of the rope which could be made to ten feet. We saw why that was so when we contrasted the modern method of manufacturing with the ancient method.

8. We saw how closely the rope industry is allied to ship building and fishing, and why New England established rope-walks early in the colonial period.

9. We studied the expansion of the rope business and the causes for its growth.

10. We located the present sources of hemp, and considered the conditions which favor its production.

11. We studied the methods of treating the fiber; the preparation of shipping and marketing the hemp.

12. We located the receiving and distributing centers, and the routes of transportation.

13. We considered the methods of rope making in Egypt, Spanish America, and among the Indians.

14. In the mathematics we learned the method of purchasing rope according to the trades.

15. We studied problems involving the use of the painter's-fall and the method of estimating the amount of rope needed for four strands, or eight strands, according to the height of a building. In grade eight the boys studied problems determining the diameter and circumference of rope—and, also, many examples in percentage.

In hygiene, we obtained an impressive lesson while visiting the cordage factory. The operating room, with its clouds of dust, spoke clearly of the dangers to health, and the necessity of using some device for preventing the inhalation of dust germs. The boys suggested several schemes which might be practical and effective. A discussion of the subject was continued at our next regular lesson in hygiene.

In correlated reading, we obtained information from many sources.

From the Dutch Boy Magazine:

(1) How Painters Test Rope.
(2) From the Abaca to Rope.

From The American Cordage Magazine:

(1) Jute Cordage.
(2) Manila Hemp.
(3) Sisal Fiber.
(4) How American Manila Rope Is Made.

From Encyclopedias:

Caulking.	Sisal.
Oakum.	Jute.

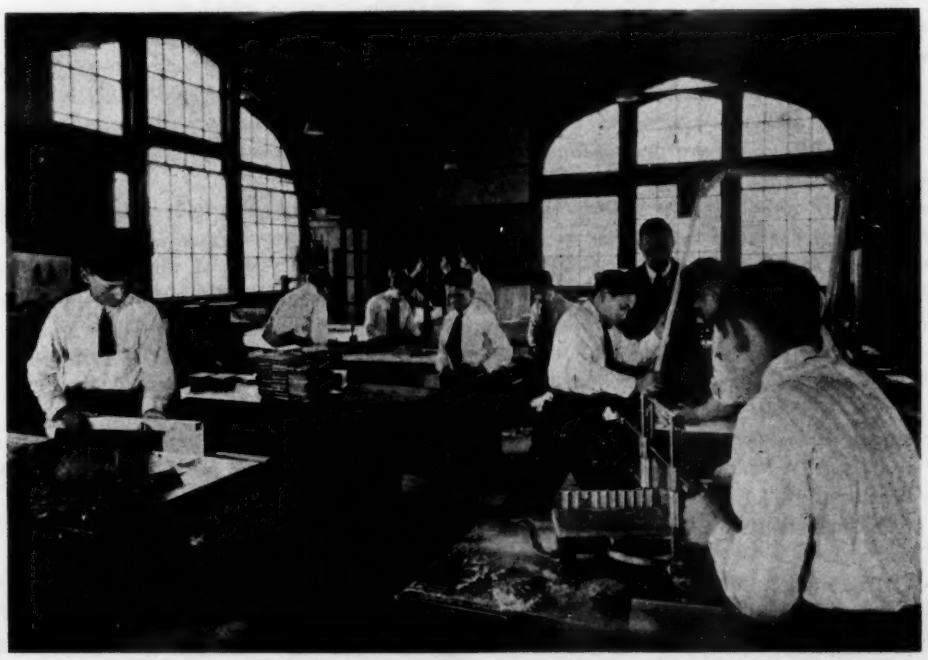
From Longfellow's Poems:

The Rope Walk.

In drawing, which was purely voluntary, the boys contributed the following illustrations:

An Old Rope-Walk in Boston.
The Rope-Walk at the Navy Yard.
Three Strand Rope.
Four Strand Rope.
Long and Short Jaw Rope.
Rope Making in Egpyt.
Ships Anchored with Rope.
Maps Showing Centers of Production.
Maps Showing Receiving and Distributing Centers.
Maps Showing Routes of Transportation.
Lettering for 35 mounted specimens, and for the nine large photographs already referred to.

Statistics may be uninteresting and unconvincing in summing up the results of project teaching. The gain in knowledge may or may not be tabulated, but the larger, deeper, spiritual gain to the child cannot be measured. One cannot estimate the value of the interest aroused, the training of the powers of observation, the encouragement of independent thinking, acting, and planning which result from this method of instruction. A method in which the pupils and the teacher develop a free spirit of cooperation; a method in which the child takes the lead and gains confidence in himself; a method in which both pupil and teacher have a better understanding of each other, and respect each other's opinions. These experiences are worth while because they tend to strengthen human relations, which are, above all, the foundations on which life expands to its best uses.



Junior Red Cross children in New York City making toys to be sent abroad or distributed to the children of the city hospitals. The group appear in "Father Knickerbocker's Children." The scene is laid in the manual training class of Public School No. 168, located in Brooklyn.

RECONSTRUCTION COURSES—VI

C. R. Miller, Williamson Free School of Mechanical Trades, Williamson, Pa.

Machine Shop Practice. First Three Months.

First Week—One hour per day is devoted to study of the machine shop primer. Each tool is to be studied and seen in the shop. This study continues thruout the first three months, as indicated in following notes under "primer study".

Lathe work is to include centering, facing, champhering, straight turning, shouldering, correct use of scale and outside caliper. The names of the parts of the lathe are to be studied.

Second Week—Primer study; names of lathe parts reviewed; truing lathe centers, shouldering, necking, filleting. Use of micrometer caliper.

Third Week—Primer study, chucking, drilling, reaming, boring, use of inside caliper.

Fourth Week—Primer study, simple thread cutting, right hand. Study of forms of threads and standard pitches for U. S. system. Refer to Machinery Handbook.

Fifth Week—Primer study, left hand thread cutting. All thread work to be properly fitted to nut.

Sixth Week—Primer study, making running and drive fits, allowance table in handbook studied.

Seventh Week—Primer study, taper turnings and fittings by footstock method; calculations, study of standard tapers from handbook, Morse, Brown and Sharpe, Jarno. Properties thoroly understood.

Eighth Week—Primer study, continued study of properties of standard tapers. Practice in turning tapers using taper attachment.

Ninth Week—Primer study. Practice in use of follow and backrest. Reason for use of these tools explained.

Tenth Week—Primer study. Practice in tapping, and inside thread cutting, fit bolt to each nut made and have gauge for fitting larger thread.

Eleventh Week—Primer study. Knurling and crowning, purpose of each class of work.

Twelfth Week—Primer study. Angular work using square nosed tools and use of compound rest. The bevel and bevel protractor are taken in this work.

During the first three months the student should have been taught to keep his machine in good condition and properly oiled, to grind to proper form all tools, and to trim and lace a belt. The first attempt with each detailed project is taken with a practice piece, but the final effort should be a useful article. Successive exercises should introduce steps serving as a review of earlier steps.

Machine Shop Practice. Second and Third Three Months.

During these periods at least one hour a day is to be devoted to the study of Machinery Handbook. The subjects outlined below are to be carefully studied, all terms explained, and an understanding of all tables involved carefully developed. Topics covered:

Lubricants.
Keys and keyways.
Elementary study of cams.
Elementary study of spar and bevel gearing.
Belts and pulleys.
Bolts, nuts and machine details.
Cutting speeds and feeds.
Tool grinding.
Counterboring.
Reaming.
Allowances for fits.
Measuring instruments and gauging methods.
Spirit levels.
Grinding.
Polishing and Buffing.
Grindstones.
Files.
Screw thread systems.
Milling cutters.
Reamers.
Twist drills.
Counterbores.
Boring bars.
Heat treatment of steel.
Iron castings.
Pipe and pipe fittings.

At the machine the following work is to be carried out:

Two Weeks—Taper boring, using tape attachment, taper finish of hole by process of step drilling and reaming, angular turning work, using both the square-nose tool and the compound rest.

Four Weeks—On the drill press work using the sensitive, standard, upright and radial drills. The student should become familiar with the names of all parts of these tools and learn their operation. Work should include:

Size drilling to layout.
Reamer drilling to layout.
Tap drilling to layout.
Pipe tap drilling to layout.
Grinding and proper upkeep of twist drills.
Drilling cylindrical work to layout.
Countersinking and counterboring.

In connection with this work, the student should be thoroly familiarized with various sizes of tap drills, pipe tap drills and reamer drills. The portion of four weeks not used by the above outline is to be devoted to "run of shop" jobs, during which time simple jigs are to be used with instructions concerning their care.

Four Weeks are to be devoted to the shaper, the learner is to be familiarized with the parts of the machine, care and upkeep is to be taught. The work is to include parting, surfacing, down cutting, angular cutting, cutting key ways, planing cylindrical, hexagon, square and octagonal work. Remainder of time devoted to "run of shop" jobs.

One Week on forge work. The students are to be taught to forge chisels, parting and side tools, together with hardening and tempering of same.

Five Weeks are given to planer work including vise work, parting down cutting, angular work, use of stakes or fingers, stringing, use of anchored tool, use of knee or angle plate. "Run of shop" jobs are taken on at the close of this series of steps.

Four Weeks are devoted to milling-machine work, including slabbing, end milling, use of vertical milling attachment, use of dividing head on gear cutting. A period is given on "run of shop" jobs.

Four Weeks are given to turret lathe on work requiring simple and multiple stop, turning, shouldering, champhering, thread cutting, drilling, tapping, use of cross stops, use of shell drill holder, reserve stopping and boring.

Fourth Three Months of Machine Shop Practice.

During this period a portion of each day is to be assigned to the study of Smith's "Advanced Machine Work." This text is to be studied thruout and explanations given of all terms and processes not understood.

Shop Work.

This period is devoted to elementary toolmaking practice, work to include taps, drills, reamers, slab, side end, and angular milling cutters. The student is to do all work on these tools including hardening, tempering and grinding. The standards for these various tools should be studied from Machinery Handbook. A period is devoted to the operation of the tool room grinder on internal and external grinding, together with "run of shop" work on cutter and reamer upkeep.

The button method of hole location is to be taught on two plates having three holes, which shall be reversible, admitting plug entrance in any position. This project is to involve the use of buttons, vernier and height gauge.

Sketching and Blueprint Reading for Machine Shop Practice.

Note: Instruments are used only in working geometrical problems. No work is inked in.

Sheet No. 1.

Problem (1) One section par. hor. lines.
Problem (2) One section par. vert. lines.
Problem (3) One section par. ang. lines to right.
Problem (4) One section par. ang. lines to left.
Problem (5) One section cross sectioned.
Problem (6) Four circles.
Problem (7) Two ellipses.
Problem (8) One section of parallel alternate dot, dash and full lines.
Problem (9) Four squares drawn in a section. Inscribe a square within each of these squares, ¼ inch smaller in diameter than larger square. Join corners of all squares with circular arc.
Problem (10) Draw three circles tangent to each other, draw in raditt passing approximately thru points of tangency.

Sheet No. 2 is assigned to the development of a good alphabet and a set of figures. Both capitals and lower cases are to be practiced. The title is in lower right hand corner of sheet. The remainder of the sheet is to be devoted to drawing the A. S. M. E. standard sections as outlined in the mechanical drawing course. Reserve the last section for the title. All work on this sheet is freehand. The meaning of sections drawn are to be explained.

Sheet No. 3—The purpose of these problems in this course is to apply the principles of geometry, to lay out problems met in the machine shop. The T square should not be used in their construction. Instruments should be limited to triangles, dividers, compass, and irregular curve.

Problem (1) Bisect a straight line.
Problem (2) Bisect arc of circle.
Problem (3) Bisect angle.
Problem (4) Lay off angle equal to given angle.
Problem (5) Lay off angle, and bisect, using protractor.
Problem (6) Lay out triangle, sides of specified length.
Problem (7) Draw tangent to a circle, and locate point of tangency.
Problem (8) Draw a square, erecting perp's by geometrical method.
Problem (9) Draw a hexagon.
Problem (10) Draw an octagon.
Problem (11) Draw a pentagon.
Problem (12) Draw an ellipse, use trammel method.

Sheet No. 4 is devoted to the elements of projection. Third angle work only. All models are to be simple machine parts from the shops. No work is to be inked in, all to be freehand practice.

Problem (1) Front, top and side view of a simple shape without dotted lines.
Problem (2) Same introducing dotted lines.
Problem (3) Same introducing a section.
Problem (4) Bolt with hex. head and nut, using conventional method of thread representation. Dimension bolt and nut for all necessary measurements, being particular that proper length of thread is given.
Problem (5) Three views of a standard "6" pulley; oil hole, keyway, and amount of crown shown.
Problem (6) A working sketch of the center support used on B. and S. milling machine. This to be sketched complete, showing all detailed parts.

Note: These six problems in projection are to be on one sheet.

This course is completed during the first year, if the assigned work is finished before the end of the year, freehand sketching is discontinued as an assigned study, and the time devoted to other subjects.

CABINET MAKING.

Summary of Course for One Year.

Shop Practice: The use of tools and application of trade processes form the foundation of the shop work. The various joints used in furniture are made and applied to constructive projects.

Wood Carving: Manual control in use of carving tools is developed. Classification of various surface treatments.

Wood Finishing: Preparation of wood surface for finish, and application of various finishes.

Furniture Construction: An elementary study of furniture styles is made; ornamentation, and the classification of furniture.

Blue Print Reading and Elementary Drawing: The conventionalities of mechanical drawing are taken under the head of blue print reading. Practice in reading prints. Sufficient practical work in sketching to give manual control, and assure ability to make an explanatory freehand sketch.

English: A concise and simple style in speaking and writing should be developed.

Mathematics: The elementary algebra should be taught after the textbook has been covered.

The following texts are used in this course:
"Wood Carving," by Simmonds.
"The Hardwood Finisher," by Hodgson.
"Furniture for the Craftsman," by Otter.
"Effective English," by Claxton and McGinness.
"Vocational Mathematics," by Dooley.
"Furniture Drafting and Design," by Nye.
"Shopwork and Joinery," by Rush-Conway.

Shop Practice—24 Hours Per Week.

The following processes are to be mastered in carrying out the projects listed:

Use of chisels, gimlets, bits, saws (rip, crosscut, back, keyhole, compass, and bow), screwdrivers, square, bevel, gauges, bevel protractor, marking gauge, breast drill, mallet, hammer, dividers, files, countersink, clamps, grindstone, emery wheel, oil stone, slip stone, various lathe tools, miter box, and shooting board. Trade classification of various tools, as well as knowledge of use. Trade classifications for nails, brads, screws, emery cloth, sand paper, rules, glue, and general shop supplies.

Projects.

1. A 12-inch rule is made up and graduated to 1/16 inch, the same is finished and shellaced.
2. A butt joint is dowelled and glued.
3. A glued rabbetted joint is made, using a triangular reinforcing block at the corner; it is related to chair construction.
4. A mortised keyed joint is made. Stop champher one member, and run champher around all edges of other members.
5. The glued splined miter joint.
6. Make an oak frame for discharge papers, using the glued splined miter joint at the corners. Champher all edges.
7. The open dovetail joint, finish by gluing.
8. The glued lapped dovetail joint.
9. Glued housed tongue joint.
10. Standing dovetail joint.
11. The hinge joint.
12. A bookcase is made similar to the one illustrated on page 256 in "Furniture for the Craftsman" by Otter. All constructive features should be of approved design.
13. Lathe exercises; parting, straight, taper, and formed turning.
14. An umbrella stand is made as shown on page

106 in Otter's text. The legs are to be turned similar to the legs shown on the table on page 113.

15. Blind dovetail joint (mitered).

16. Inlaying. Make up an inlaid checkerboard of standard size and design.

17. Constructive project involving application of elements. Set of porch furniture in oak. In carrying out these projects the student is taught the operation of the saw bench, surfacer, jointer, sander, bandsaw, and wood turning lathe.

18. Practice in bending wood by means of kerfing, and also by steaming. Apply to specific projects.

Wood Carving—4 Hours Per Week.

Text: "Wood Carving," by Simmonds.

Gouging, V-tooling, and simple pattern work as applied to furniture ornament.

Each elementary project should be worked on a 4x6-inch plaque, with edges champhered, before an attempt is made to apply the designs to furniture.

Practice in ornamentation on projects constructed in cabinet making.

Paper cutters, ink stand holders, and similar projects used if time is available.

Wood Finishing—2 Hours Per Week.

Text:.."The Hardwood Finisher," by Hodgson.

Elements of wood finishing. Preparation of wood for finishing. Construction and upkeep of tools used in wood finishing. Wood fillers and filling processes. Staining, varnishing, polishing, dyeing, ebonizing. These processes carried out on plaques 4x6 inches and one-half inch thick.

The various commercial stain to be applied to a certain number of plaques. These to be in natural, dark oak, mahogany, golden oak, fumed oak, moss green, and weathered stains. Use Johnson's stains or equivalent.

Furniture Construction—3 Hours Per Week.

Texts: "Furniture for the Craftsman," by Otter.
"Furniture Drafting and Design," by Nye.

Styles of furniture. Standard dimensions of furniture. Special tools and equipment adapted to furniture making. Elements of ornament. Tables, stands, stools, chests, cabinets, hall frames, corner seats, desk chairs, settees, side and arm chairs, morris chairs, pedestals, wash stands, wardrobes, bookcases and small furniture. Porch and garden furniture studied from a structural standpoint.

Blueprint Reading and Elementary Drawing—4 Hours Per Week.

Instruments are used only in geometrical problems. No work is to be inked in.

Sheet No. 1. Same as outlined under Machine Shop Practice.

Sheet No. 2. Develop a good slant alphabet and set of figures. Both capitals and lower case to be practiced. Title in lower right hand corner of sheet.

Following lettering, devote six drawing periods to study of blue prints. These prints should include the standard elementary prints on pattern making in use in the school shop and prints of various articles of furniture.

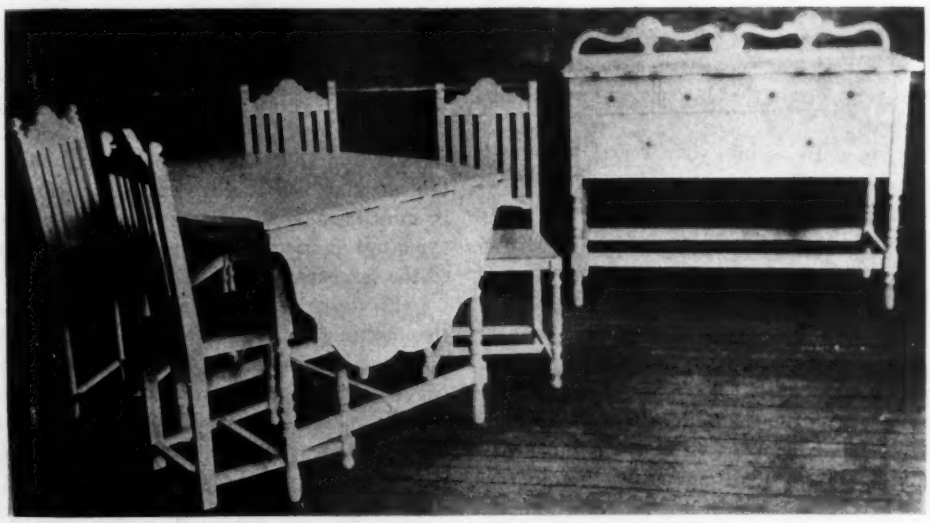
The following points should be brought out:
Arrangement of views.
Introduction of sections.
Witness lines.
Dimension lines.
Center lines.
Dimensioning; detail and overall.

Sheet No. 3. Same as outlined under Machine Shop Practice.

Sheet No. 4. Devoted to elements of projection, using third angle work only.

(1) Front, top and side view of a dowelled butt joint.
(2) Same of mortise and tenon joint.
(3) Same of half lap dovetail joint.
(4) Same of standing dovetail joint.
(5) Working sketch of checking device shown on page 96 in Otter's text.

This work is followed by another period of blue print study, using more advanced prints such as, plans and details of a modern house.



A BREAKFAST ROOM SET MADE AT THE WACO (TEXAS) HIGH SCHOOL.
L. R. Stanfield, Supervisor, Manual Arts.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

THE SPIRIT THAT WINS.

HAVE you taken the spirit of vacation into your school? We are not thinking of the more or less reckless and careless abandon with which virile people enter vacation outings. We have in mind the wholesome and whole-hearted enjoyment which characterizes, or should characterize, a well ordered vacation where one does as he chooses and enjoys it to the full.

Did you go back to your work as if you were going to a task that must be done to specifications at so much per week or month or year? Or did you rather enter the new year as if you had great plans and were ambitious to achieve certain definite and vastly important results and were experiencing a deep satisfaction in undertaking again the problem of building a life's work?

To many teachers, the years are simply a procession of never ending duties to be done and tasks to be performed. To the successful teacher, the years are a *progression* of opportunities, each a factor in a larger opportunity for service. To such a teacher, each year's work is a perfectly definite achievement that carries his life plans one step nearer completion.

It's the spirit that counts. The unhappy, disgruntled worker in any field is never a success. The rewards very naturally come to the optimist. The pessimist is always surprised at any sort of success and is very sure that the success was not deserved, unless perchance a certain degree of success should come to him and then he is very certain that his success by no means equals his deserts.

Take the joy of living into your work. Make each class feel that each recitation is a privilege and a distinct achievement and that each day is a new opportunity. He who fails to get the joy of life in his daily work has but small opportunity to get it elsewhere.

The spirit that wins is the joy of work and the satisfaction of achievement.

NO CONFLICT BETWEEN MANUAL TRAINING AND VOCATIONAL EDUCATION.

A supervisor of manual training in a considerable city asks if the rapid introduction and widespread development of vocational education means the elimination of manual training from the schools. We feel perfectly sure that the growth of vocational education will not only *not* eliminate manual training but that it will emphasize the importance and necessity of such work in the schools.

We can see no more reason for the elimination of manual training by vocational education than for the elimination of courses in general science by the introduction of agriculture. Vocational education is a perfectly definite procedure for those who have chosen their life's work. Manual training provides general preliminary courses for experience and appreciation for those who may never enter any sort of trade or industrial work as well as for a kind of prevocational or finding course for those who look forward to some trade or technical field.

The manual training work is just entering its most fruitful and promising stage. It is just breaking away from the rigidity and inflexibility that so long impeded its progress. The next ten years should witness a wonderful development especially in the content of manual training courses. Manual training is established with those who really do the thinking for the educational world. The manual training teachers should push right ahead with great vigor in developing new lines of work, enriching the old courses, vitalizing their methods, and putting such content into their work as will command the respect of the educational world.

Now is not the time for discouragement among manual training teachers. Now is the time for understanding and intelligent, vigorous work. Now is the time to quit claiming vocational purpose and skill for manual training work. Teachers must know that the ordinary manual training is not designed at all to train workers for the trades. It gives types of experience and broadens the students' contact with the world and their outlook upon life.

SALARY AND EFFICIENCY INCREASES.

AFTER a certain board of education had voted a fifty per cent increase in the salary budget, a member of the board offered a resolution to the effect that the board had a right to expect a fifty per cent increase in teaching efficiency.

Such a salary increase undoubtedly will increase the efficiency of teachers by making them feel that their work is appreciated and by taking their minds off of the pressing and often discouraging problem of trying to make ends meet. But to expect an efficiency increase in proportion to the salary increase is to assume something not quite creditable to the spirit and past services of the teachers.

Be it said to the everlasting credit and honor of the teaching profession that it has never gauged its duties and its service by the almost negligible monthly pay checks. It has never struck for higher pay and has never loafed on the job because it failed to receive a living wage. On the whole, teachers have conscientiously worked to the very limit of their endurance, and have never permitted the question of pay to stand for one minute between them and the fine, conserving labor which they alone can perform.

It is a little far-fetched, therefore, at this belated hour to add a pittance to the shamefully small pay of the common school teacher and then, Shylock-like, demand full returns in increased service. The increases

may very properly be regarded as belated recognition of obligations long past in the form of back pay for ample and unrewarded service rendered. The teachers' efficiency will be increased by the salary raises, but in the main teachers will be disposed to feel that the increases are but the beginning of the long dreamed of but scarcely hoped for liquidation of a bad debt.

"COMMERCIAL ART."

You have probably heard or read a common expression of the present day, "There is a little Psychology in it." The expression is used in explanation of phenomena that cannot be well explained otherwise. For want of a better explanation, it seems to apply to the contagious ambition on the part of so many young people today to become "commercial artists." Private art teachers who have observed this ambition are now offering instruction in "Commercial Art." The art schools are very generally offering courses in commercial art, and they are popular beyond all other courses.

Commercial art is, in the minds of these ambitious young people, a marketable kind of product that for some unexplained reason is within the talents of those who would scorn the study of painting or sculpture. A poster competition will bring response from scores of youngsters who will work overtime to finish their posters, but who would not willingly spend one hour in a drawing or painting class.

Commercial art involves a great variety of technique and subject. In a recent collection of the best American commercial art, there were exhibited splendid landscape effects, splendid figure drawings, and a variety of illustration ranging from the most realistic figures and still life painting to the most impressionistic and unique conceptions. All of this had been used for advertising. All of it was strictly commercial art.

In view of the loss of interest in drawing and painting in our schools, is it not well for the art teacher to take advantage of this new interest and to teach lettering, design, drawing, and painting thru the attempts at commercial art which so many pupils aspire to do?

THANKSGIVING.

What have we, as teachers, to be thankful for? Last year we were especially concerned over the avarice of those who would charge more than we could pay for the commodities of life. This year we see a little relief in a slight increase of wages and perhaps a slight reduction in the cost of living. Most of us are not yet teaching and living on a sound financial basis, but we can be thankful for a little relief from debt. The art teacher of this year can use the turkey as a symbol of thankfulness with a little better grace than last year, tho she may have faint hope of celebrating the day with roast turkey on the table.

We may not be thankful in the hope of doing better school work than in previous years, for our classes are multiplied and crowded as never before. In many cases our equipment is short of absolute necessity, and the work must accordingly suffer. What, then, can we be thankful for? There is one thing for which every American teacher can be thankful for. It is the evidence of the realization on the part of the American people that education is essential. Never before have the schools been crowded with such numbers of students who seem to feel that schooling is as needful to living as the food they eat and the clothes they wear.

There is evidence that within a few years the business of education will lead every other business of the country. At the present time the industries related to school affairs are flourishing, while other lines are not so promising.

Then, too, we can get much satisfaction in the thought that what the American people seem to want so badly is the thing we have always advised. We have always told the wayward youth to go to school. We have always felt that education was the salvation of our country and our people. With the assurance that we belong to the greatest and most beneficial industry of the greatest people of the world, we must be thankful. Let us give thanks.

ARTISTIC TEACHING.

That definition of Art as "the best way of doing things" is not gratifying to the artist. Art is not to the artist a way of doing something, but a thing accomplished.

The method of doing is much in the mind of the aspiring artist, but the accomplished fact is the only gratification of the accomplished artist.

It is the hope of accomplishment that keeps the artist fresh and vigorous in his work.

The product of capable teaching is not so tangible as evidence of artistic performance as is the product of the industrial artist, yet the evidence of capable teaching is not lacking in our American citizenship.

When we reflect on the increasing confidence in education, we realize that the art of teaching has become a thing accomplished.

"All my life I have had the feeling that each generation should possess its own art. The worship of the past can only be cured by the wholesale destruction of the monuments of the past—to drive us, by a kind of starvation—to produce our own buildings."—*George B. Shaw.*

The idea of self-help can be carried out only by productive industries. Honestly giving value for value, labor becomes a stepping stone, a ladder, to education, to all higher things, to success, manhood, and character.

"I am not willing to agree that industrial education is one thing, and that cultural education is of necessity quite another. Modern industry embodies tremendous human activities, investions, constructive imaginations and records of devotion."—*Jane Addams.*

Profit without pleasure also in the work that produces it, is like what we might suppose apples would be to us, were they not preceded by the glory of the blossoms.—*McClary's Wireless.*

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

CANTON TRAP NEST.

Robert H. Smith, Department Farm Engineering, State School of Agriculture, Canton, N. Y.

A system of trap nesting is essential in choosing a strain of layers for building up the farm flock;—it has the same relation to profitable poultry keeping that the Babcock test has to successful dairying. There is a general interest in poultry among boys and consequently the design and construction of trap nests and other appliances for the hen house make vital projects for the farm shop. The nest shown presents several advantages. The door drops down behind the hen and does not cause her to back out by dropping on her shoulders as she attempts to enter.

The door automatically locks in place when it drops, preventing the escape of the bird until released by the attendant.

The act of removing the hen from the nest sets it for the next bird.

It is very simple and adapted to unit or group construction and may be made from any box of approximately the size shown.

A removable top and interior mechanism make it very easily cleaned and therefore sanitary and free from vermin.

Material List.
Lumber.

All material to be surfaced all sides.

No. of Pieces	Finished Size	Where Used.
3	½″x4″x1′—4″ S4S	Top
2	13/16″x13/16″x11—⅞″	Top cross members
2	13/16″x11″x1′—0″	Ends
2	½″x11″x1′—4″ or boards to make equal width.	Sides
1	½″x1′—1″x1′—10″ or boards to make equal width.	Bottom
1	13/16″x1′—¾″x1′—1″	Perch
2	13/16″x2½″x11″	Door guides
1	½″x5″x11″	Door
1	¼″x1′—⅛″x4″ (hard wood)	Door catch
2	½″x¾x4″	Door cleats
2	13/16″x1″x1—½″ (tough hard wood)	Buttons

Hardware.

One piece number 9 wire 3′—0—½″ long for door support.

Two No. 10—1—¾″ F. H. B. wood screws for top buttons.

One poultry netting staple for door catch.

Two 6D finishing or casing nails to lock door down when it drops.

Quantity of 3D and 6D box nails for assembling nest. Cement coated nails desirable.

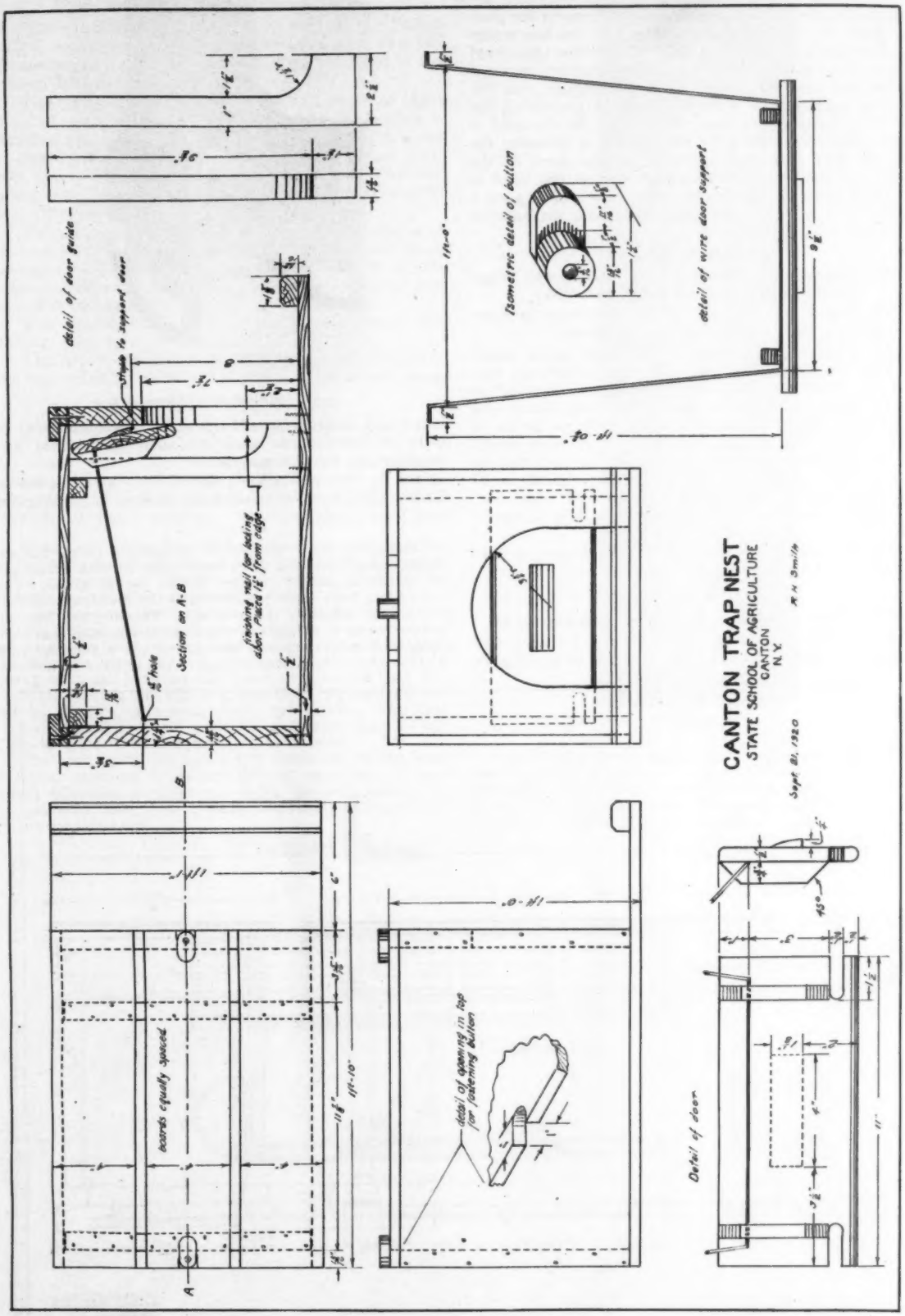
½ dozen ¾″ brads.

Method of Assembling.

1. Dress stock to proper size or if other thicknesses are to be used make proper allowance in dimensions.
2. Cut ends to size, carefully squaring them.
3. Lay out and cut door opening in front end by locating a point 3¾″ up from the bottom and in the center lengthwise of the piece. With this point as a center and a radius of 3¾″ draw the arc representing the top of the door. Square lines to the bottom, tangent to the circle so formed. These lines should be 1¾″ from end of board. Remove material with cutting-off and compass saws and smooth up edges with spoke shave and rasp.

   (Note—For small breeds this door may be made smaller.)
4. Cut sides to size and assemble sides and ends. Use 6D nails staggering as indicated on side elevation and keep the work perfectly rectangular by frequent testing with square.
5. Lay out and construct door guides, using compass saw for curved portion. Make perfectly smooth to permit the door to drop freely and nail in place as shown in section.
6. Construct pieces for bottom and nail in place using 6D nails for the ends. When assembling use square frequently to test alignment.
7. Construct top, arranging cross members to fit smoothly in place as indicated in section. Space boards equally, leaving cracks for ventilation. In center of each end, ⅜″ from the edge bore a hole with 1″ auger bit and remove the waste wood as shown in the detail to provide an opening for the fastening button.
8. From tough wood make fastening button like full size detail, boring the 3/16″ hole and countersinking it as first operation. Grip wood in vise while boring to prevent splitting. Attach in proper place with 1¾″ No. 9 F. H. B. wood screws.
9. From ½″ material cut out door as shown in detail. Make slots in lower corners for locking it down by first boring a ½″ hole ¾″ from the bottom edge and 1¼″ from the end and then sawing out the wood between the hole and the end.
10. Make the door catch, preferably of maple of the size and shape shown in dotted lines and end view on detail and fasten in the place indicated, using ¾″ brads.
11. Make the door cleats as shown in detail of door and fasten in the position shown after first making the wire door support as given in the next item and placing it beneath them. It must move freely as it acts as a hinge.
12. From No. 9 wire bend door support to the size and shape shown and fasten beneath the door cleats as indicated above.
13. In center of front end of nest box at a point 8″ above the floor drive a poultry netting staple with flat side up to serve as a catch upon which to hook the door when it is raised. It should be left projecting ⅜″.
14. At points 2½″ from the floor on either side and 1½″ in from the side walls on the inside of the front end, drive a small finishing or casing nail to serve as a catch upon which the door may lock when it drops. These nails should be left projecting ½″ and bent so that they point slightly upward. Their position is shown in the section.
15. Bore the 3/16″ holes in the sides of the nest box as shown in the section and after spreading the wire door support so that it will press snugly outward against the sides of the box insert the stub ends in these holes and drop the door in place.
16. By bending or otherwise adjusting wire adjust door until it operates smoothly and easily.

Suggestion. Treat all joints with creosote oil when assembling to make nest vermin proof.



DETAILS OF TRAP NEST.

Operation.

To set the nest the door is raised and the catch left resting upon the staple above the door opening in the position shown in the sectional drawing. As the hen enters it is dislodged and drops and, as it falls, strikes the curved portion of the door guides and is deflected toward the front so that the slots cut in the door ends engage with the finishing nails put there for the purpose, preventing the door from being raised from the inside. As the hand is inserted from the outside for the purpose of releasing the bird, the door is pushed backward up the curve of the guides and released from the nails and as the hand is further inserted it rides up the wrist and arm to such a position that it is automatically reset when the hand is withdrawn with the bird.

PIANO BENCH.

F. W. Ziegenhagen, Instructor in Woodwork, Boys' Technical High School, Milwaukee, Wis.

The piano bench shown is an interesting problem for pupils in first-year high school woodwork.

All the necessary information is shown in the drawing with the possible exception of the leg fastened into the base. This may be made either with a doweled or tenoned joint. The legs of the piano bench should run the entire heighth 17¾" and a joint made as shown in section A-A. This is done in removing whatever thickness the rail stock happens to be from the legs, making a mitre joint at the corners. Either a ¼" panel, or ⅜" solid stock may be used for the bottom of the bench box. This rabbet must be machined before the box is assembled.

The problem may be made of birch, mahogany or oak, stained to suit the maker.

A PORCH ROCKER.

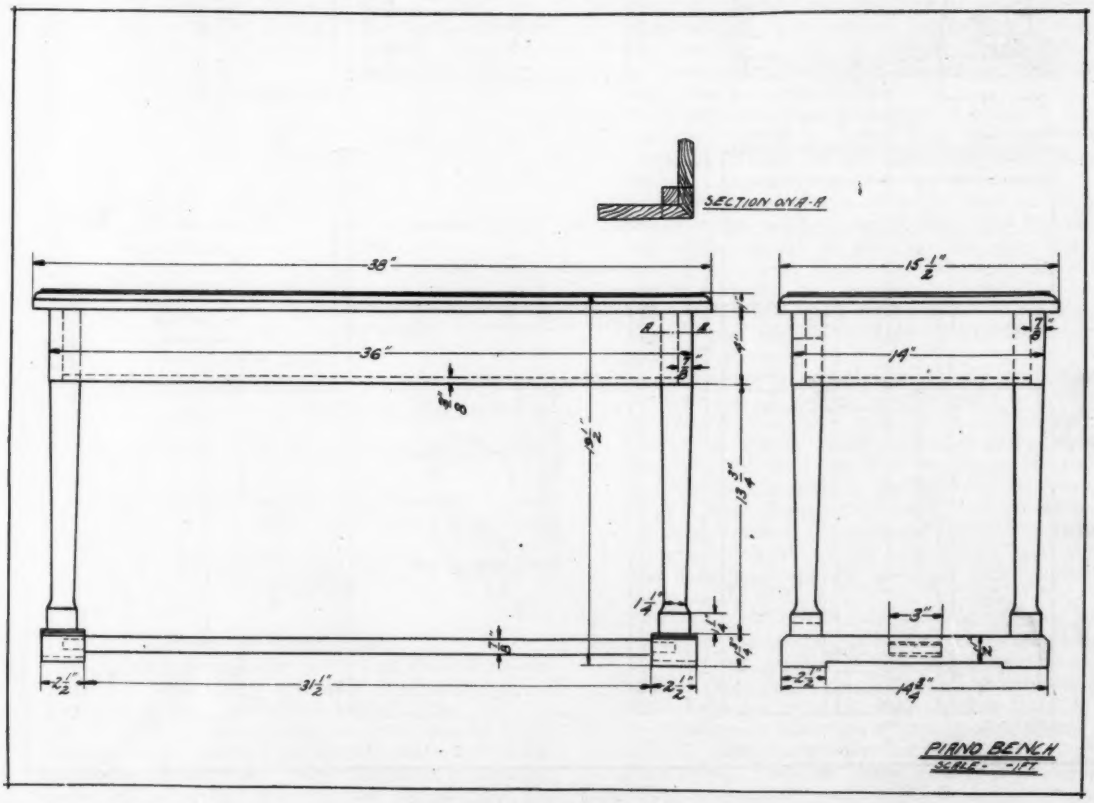
W. W. White, Director of Manual Arts, Waterloo, Ia.

The rocker illustrated has been found useful and popular. It affords some opportunity for originality in design and is simple in construction. The rocker may be made of soft or hardwood and may be stained and varnished, painted or enameled.

PORCH ROCKER.

In the Waterloo schools several boys have reproduced the design in wood salvaged from packing boxes obtained from local stores.

Industrial Work Extended. **Muskogee, Okla., has extended industrial work downward to the seventh grade and has added an extra semester in the eighth grade. The change has been made possible thru the erection of a new junior high school on the west side. Printing has been introduced with a vocational trend, an elementary course in automobile mechanics has been added and a machine shop is planned as soon as the necessary bonds have been voted.**



DETAILS OF PIANO BENCH.

A WINTER PROBLEM.

W. A. Cory, Supervisor, Fairmont, Minn.

Any community in the northern part of the United States, especially where there is a toboggan slide or a hill suitable for laying out one, will find boys interested in the problem here described.

The toboggan in the illustration was made of eight strips of pine, each ¼″x2″x8′. One end of the lumber is planed or ripped to one-quarter inch thickness back about two feet from the end. The ends are then soaked overnight in a tank of boiling water, bent around a twelve-inch pulley, fastened with wire and screw eye and allowed to dry. Cross pieces are made of ¾″x2″x16″ oak.

The slats are fastened to the cross pieces by means of one inch, No. 8 or No. 10 flat-head screws put thru from the bottom and countersunk. Place three oak ribs on the bottom for runners. A quilt or blanket, or a piece of carpet will serve as a seat.

The second drawing shows a successful frame for bending skis.

The writer has found straight grain white or yellow pine best suited for making toboggans in the school shops.

TWO TIRE VULCANIZERS.

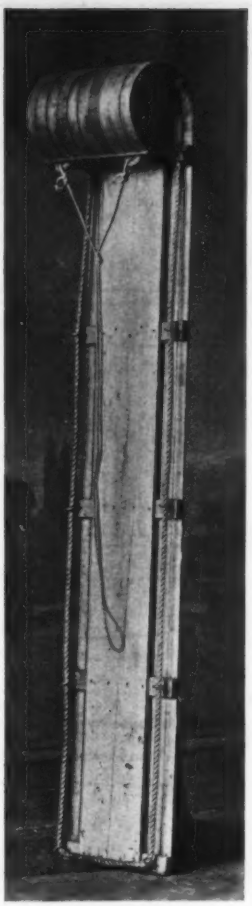
Edmund C. Hanley, Muskegon, Mich.

The accompanying drawings show details of two vulcanizers which have proved popular with the pattern-making and foundry classes in the Hackley Manual Training School. They will be found useful in teaching many principles of simple molding. (See Page 455).

William J. Barry, formerly teacher of manual training and printing in the schools at Asbury Park, N. J., has accepted a position as Director of Vocational Work in the Municipal Sanitarium at Otisville, N. Y.

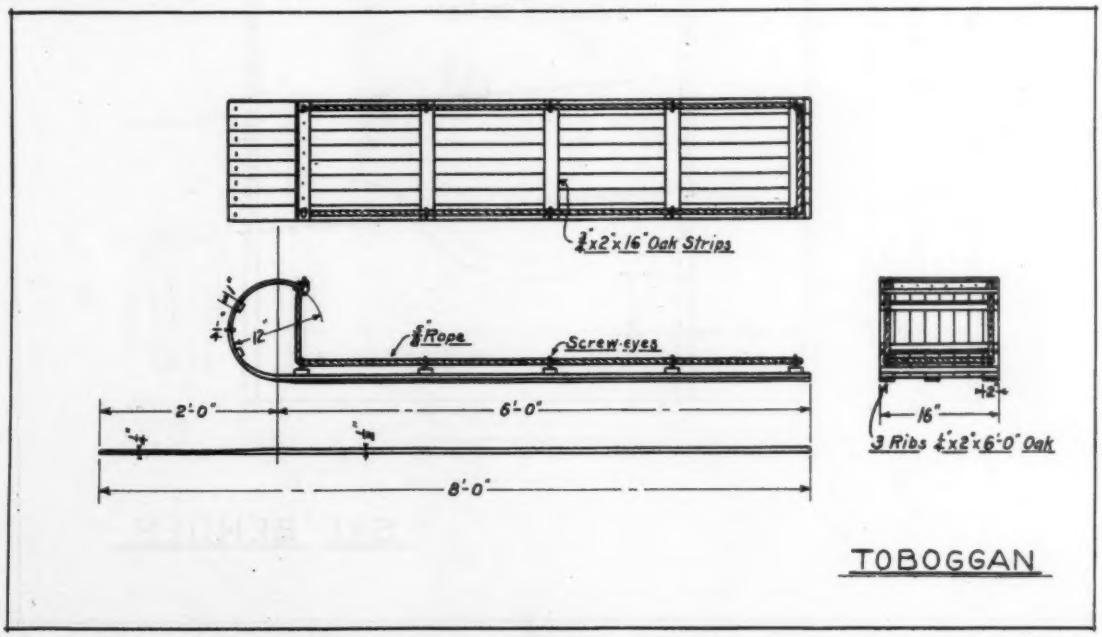
East Saginaw, Mich., Opens Additional Building. The Central School, an unused structure, has been remodeled and opened to house an overflow of pupils. The third floor will house a wood shop, a mechanical drawing room, a sewing room and a commercial room. The second floor will house the seventh and eighth grades from two sections who will be brought by special street car service. The first floor will take care of the prevocational school crowded out of the high school by the increased enrollment.

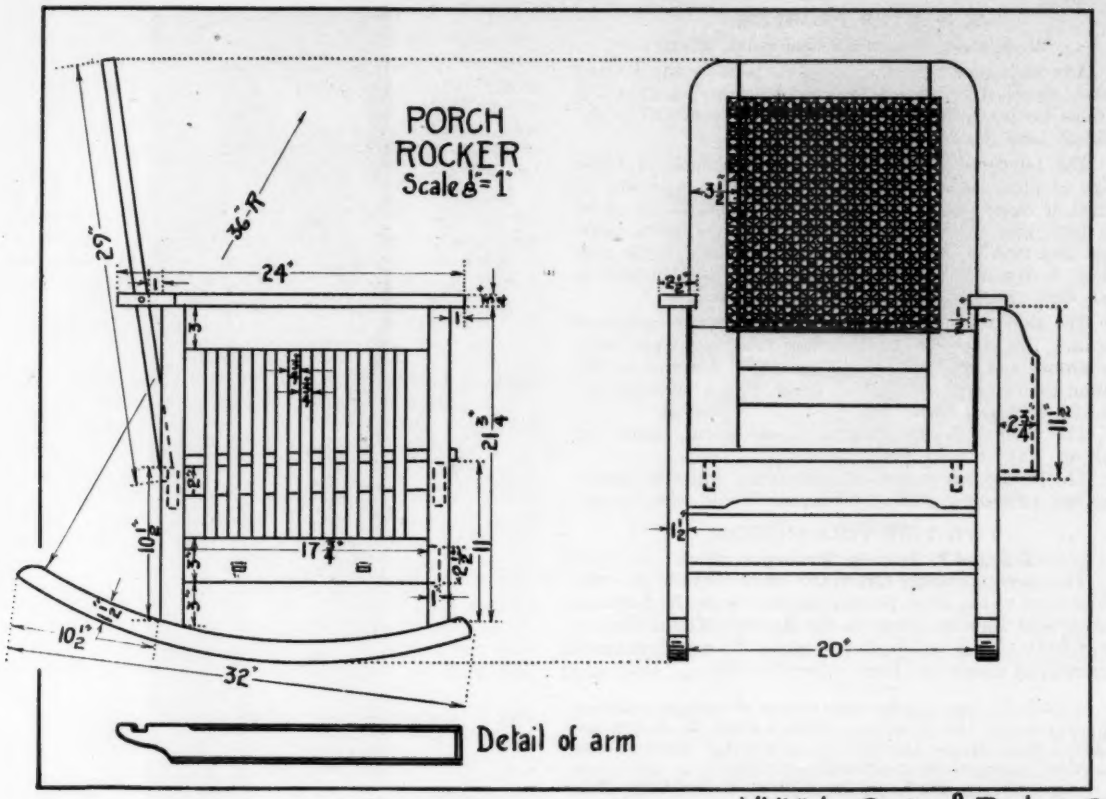
The high school has added new equipment in the form of lathes, grinders, drills and milling machines, all purchased from the government. With the new equipment, the machine shop has a very complete assortment of machinery and tools.



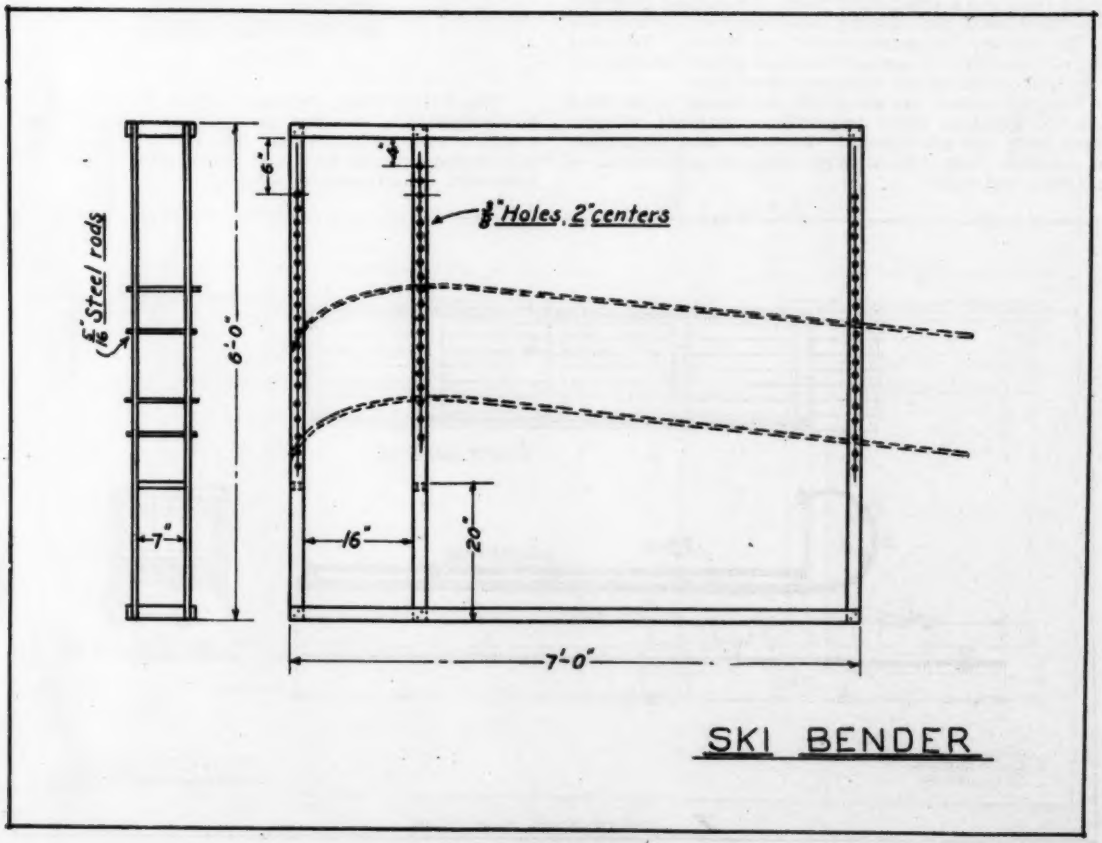
TOBOGGAN.

The United States Bureau of Mines, Washington, D. C., has completed a four reel motion picture film telling the complete story of petroleum. The film will be loaned for educational purposes and is of considerable interest to the industrial departments of schools.

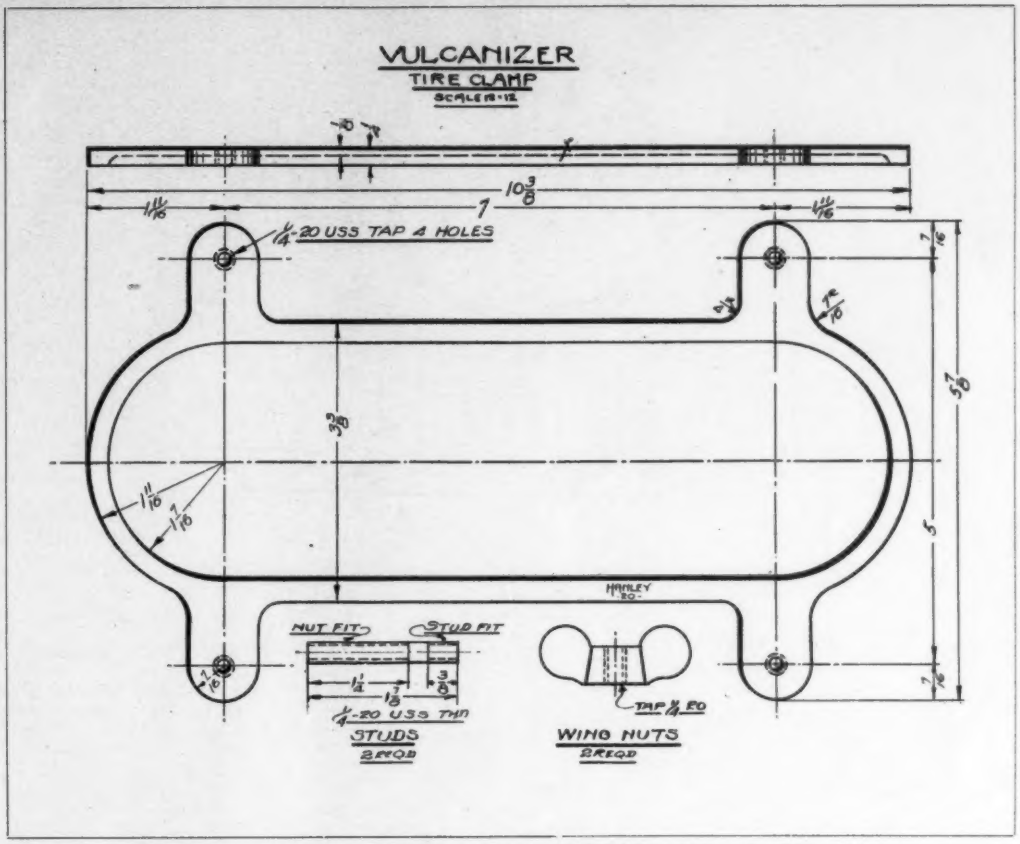




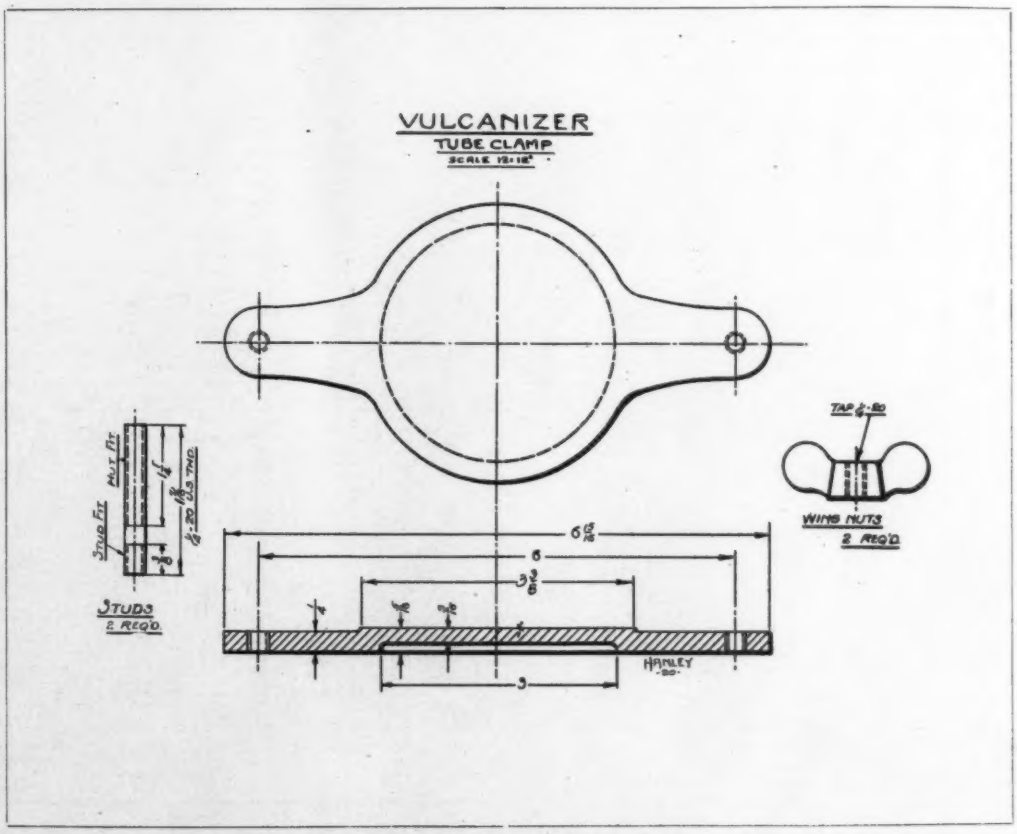
DETAILS OF PORCH ROCKER.



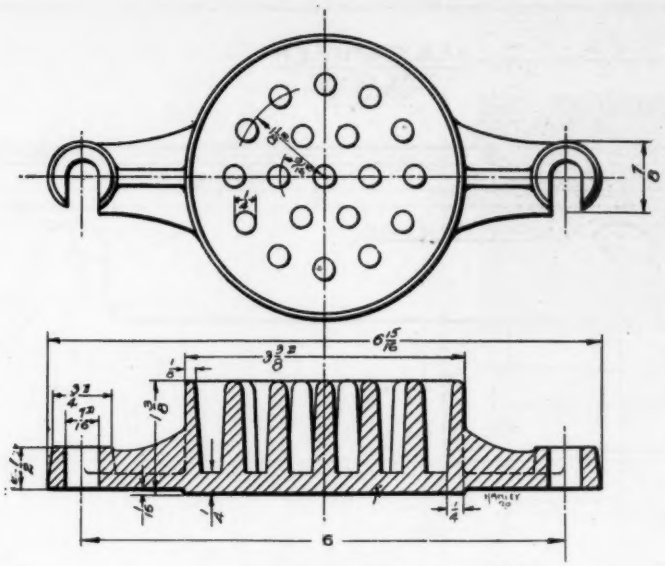
DETAILS OF SKI BENDER.



DETAIL OF LARGE VULCANIZER MADE AT MUSKEGON, MICH. (See Page 453.)



DETAIL OF SMALL VULCANIZER.

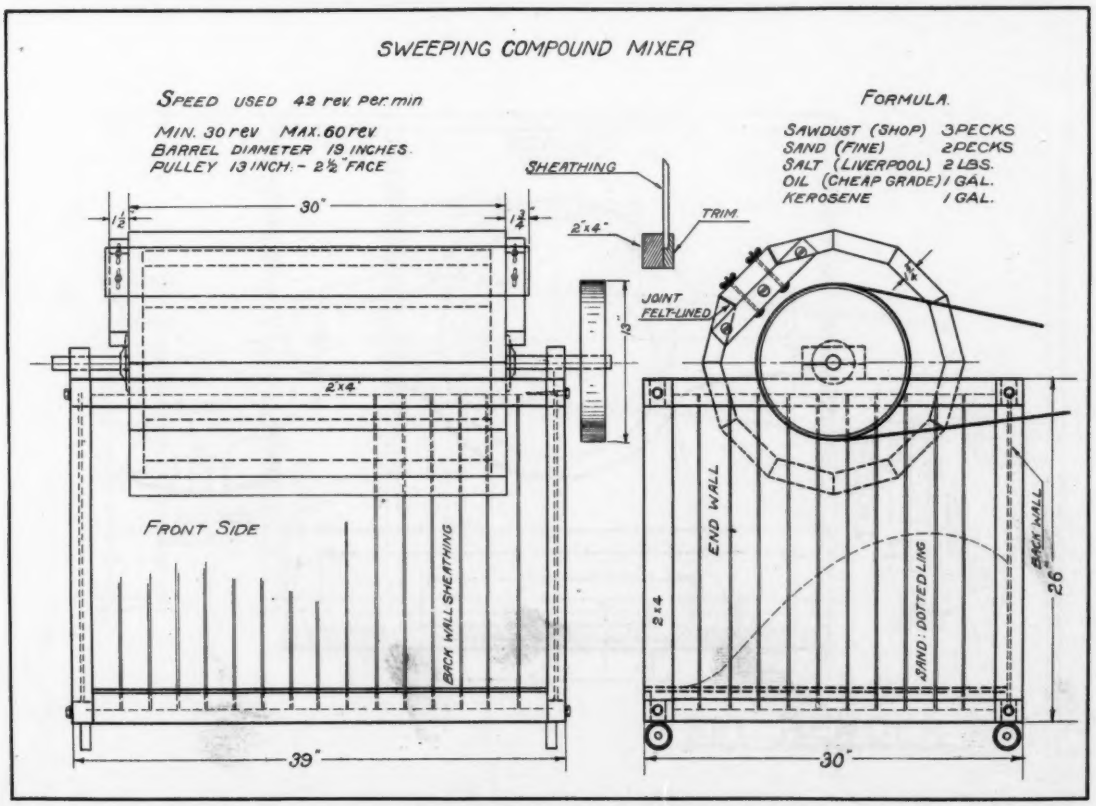


SWEEPING COMPOUND MIXER.

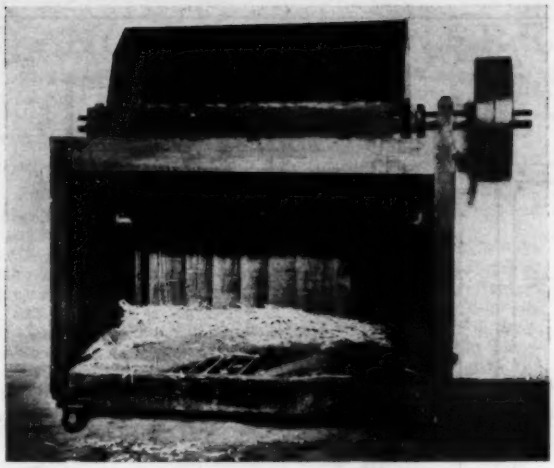
Frederick J. Bryant, Supervisor Manual Arts, Auburn, Maine.

If motor power is available in the school shop, the making of one of these mixers should prove quite interesting. In schools where a great deal of sweeping compound is used by janitors, this machine will more than make good from an economic standpoint. We hesitated about making this project at first until we had convinced ourselves that there were a number of interesting problems involved in its construction. Determining the speed ratio, tool processes similar to pattern work in making the barrel and more or less experimenting with the formula as submitted on the drawing were some of the features accomplished by the students. With a motor running 1,760 revolutions per minute, we were obliged to reduce the speed so that the mixer would run less than 60 per minute.

The frame was made of 2"x4" stock and bolted together with lag screws. Both ends, the back and bottom are walled in with pine sheathing. We used maple block



DETAILS OF SWEEPING COMPOUND MIXER.



SWEEPING COMPOUND MIXER.

for the bearings but iron mandrels are better. For the construction of the barrel, we made up two pieces of pine for the ends or headers. One was marked out with dividers to form a duodecimal shape. Two finishing nails were used to hold the headers together while band sawing the outline. Eleven of the staves were nailed and glued firmly in place on the headers. The last stave is used as a cover and is removable. The diameter of the barrel pulley depends on local conditions. The mixer was painted with two coats of black paint.

The formula on the drawing is based on the judgment of the janitors who have tried it out. It is only suggested for a trial, subject to changes or preferences. The mixer should not be more than two-thirds full at any time; and the sawdust, sand and salt should be put in first. Ten minutes is long enough to run the machine for each load. Remove the cover, roll the barrel over toward the back, so that the compound will rest against the back wall, from where it can be readily shoveled up and stored in a metal drum.

Our mixer is mounted on casters and is pushed away in a corner of the basement when not in use. We have an attachment which is clamped to the frame that holds the mixer firmly in position when in use.

SCHOOL FURNITURE CONSTRUCTION BY MANUAL TRAINING STUDENTS.

Mr. E. M. Wyatt, head of the manual training department of Houston, Tex., has issued a very comprehensive report on the making of some $15,000 worth of school furniture by the boys of the manual training department during the past spring and summer. The furniture which was constructed for two high schools and a grammar school, cost $11,845, and is considered a little above the average quality for the same articles bought in the open market.

The idea of furniture construction in the school shops had its origin near the close of the last school year. The high prices in the furniture trade and the fact that several well equipped wood working shops were available, made it appear feasible to use the shops for the construction work. In the work, the primary aim was construction and the secondary purpose was education. The work was performed almost wholly on Saturdays, after school hours and during the summer vacation. Some of the work was done in the regular classes when it was of such a nature that it fitted in with the course.

In the out-of-school hours working students were paid 15 to 35 cents per hour and were allowed shop credit on a basis of half of that allowed for the same time in manual training work. Teachers were paid their regular salaries. Each teacher had from four to eight student helpers and two groups worked in a shop. One was responsible for the machine work and the other for the assembling and finishing. The work was carried on in four different shops.

Attention was given to keeping the work up to the commercial standard and as a result the product turned out was somewhat above the quality which might have been purchased on the market. Discretion was used in designing the articles to fit particular conditions of convenience and use.

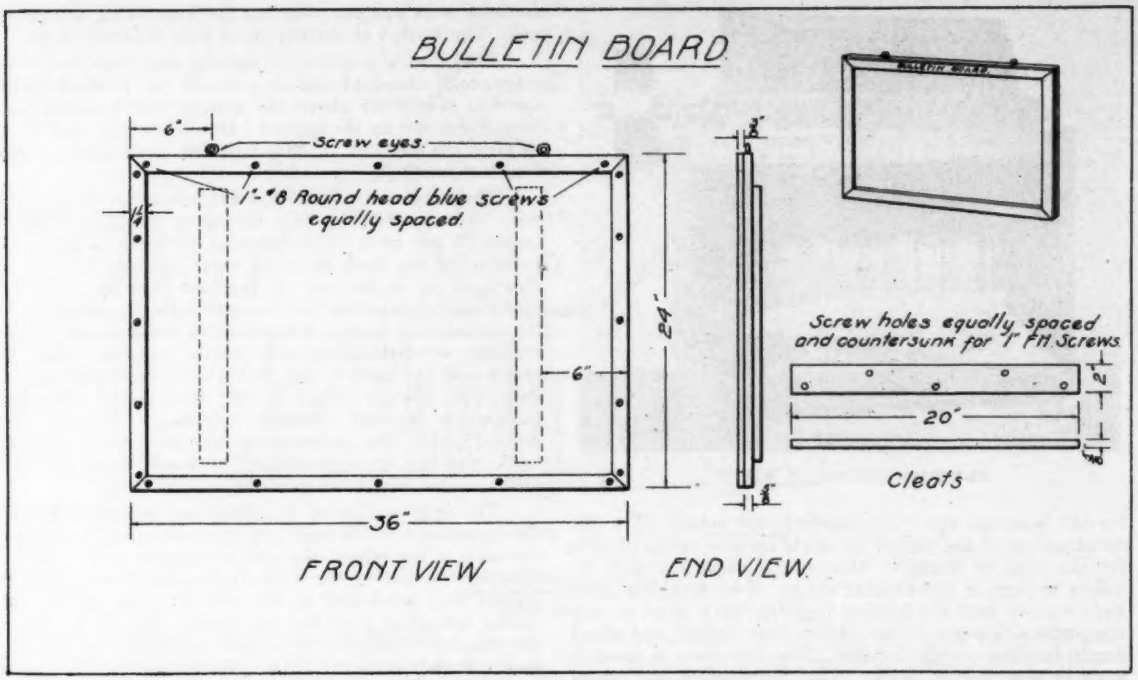
The tabulations show that $15,685 worth of furniture were built for $11,845, or a saving to the city of $3,839, nearly 25 per cent. The financial saving is ample justification for the work done but there has also been an indirect saving to the city in the fact that the work provided employment for the manual training teachers. If the schools can furnish remunerative employment to these teachers on Saturdays, and during vacation time, the board will not need to bid as high for their services and they will remain longer in the profession. The boys themselves secured valuable experience because they worked under their instructors who were interested in the work and lost no opportunity to teach them the principles underlying each procedure.

The original list of the furniture constructed shows the immensity of the task and gives comparative costs on the basis of the school cost and the market value. In considering the cost of the work, it should be noted that the lumber was purchased at the peak of high prices. The values indicated represent the lowest bids of dealers for the articles. Chairs were bought unfinished so that they might be stained to match the other furniture. The finishing of these chairs was done without any money saving as the main purpose was to insure a matching of the color.

The list which Mr. Wyatt prepared, includes among other articles, forty adjustable desks for mechanical drawing valued at $258; forty stools for mechanical drawing valued at $125; one hundred drawing boards valued at $189. For the laboratories the list includes a large number of tables, display cases, demonstration tables and similar articles. For the lunch room it includes tables and various other furniture utilities. For the library it includes book and writing tables. For the household arts department sewing tables, pattern drafting tables, dress fitting stands, etc. For the cooking laboratory it includes desks, supply tables, work tables, apron lockers, etc. For the different classrooms it includes 65 teachers' desks valued at $2,283 and 35 teachers' table desks valued at $845. For the kindergarten it includes a number of tables.

JUNIOR RED CROSS BAZAAR.

At the Junior Red Cross Bazaar held at School No. 50, Brooklyn, N. Y., the children sold articles which they themselves had made—using the proceeds for Junior activities overseas. Scenes such as these are shown in the film play, "Father Knickerbocker's Children." Most of the children in this school are Italian or Jewish.



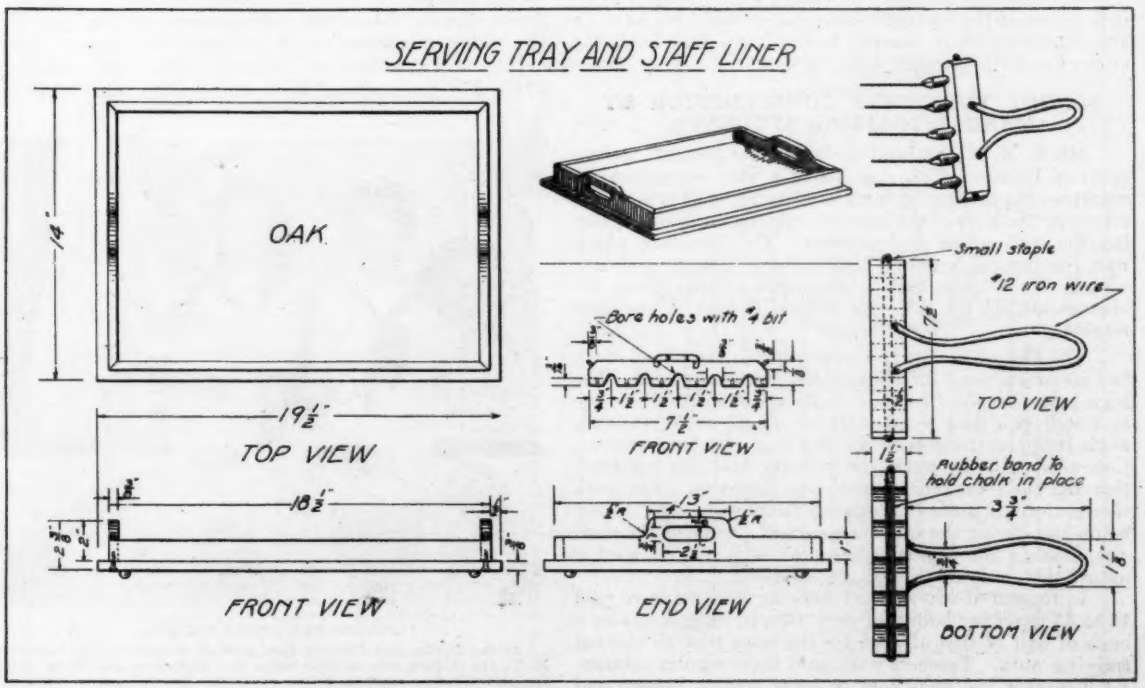
DETAILS OF BULLETIN BOARD.

SCHOOL UTILITIES AS PROBLEMS.

Leon H. Baxter, St. Johnsbury, Vt.

Every department of the schools affords opportunities for service on the part of the manual arts department. It is not necessary to have a large school system or a large equipment to produce articles which are of daily use in the schools and which embody every educational as well as vocational purpose of the school shop instruction.

The accompanying drawings illustrate a few items made in the St. Johnsbury shop. The articles are simple and explanations of the construction and finish are hardly needed. Each instructor will be able to modify the designs to meet the particular needs of his own situation.



DETAILS OF SERVING TRAY.

NOW, ARE THERE ANY QUESTIONS?

This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Re-education of the Injured in Industry.

103. Q:—Where can I obtain a copy of the United States law providing for the rehabilitation of men injured in industry?—*H. J. K.*

A:—The law which enables the Federal Board for Vocational Education to grant aid to the states in providing occupational rehabilitation for persons injured in industry, or otherwise, is to be found in the document Public, No. 236, 66th Congress (H. R. 4438). It may be obtained from any member of Congress. A reprint with valuable information is to be found in the Vocational Summary for August, 1920.

The law appropriates $750,000 for 1920 and one million dollars for each of the succeeding two years.

Silvering Mirrors.

107. Q:—Please give me information as to how I may silver, or resilver mirrors.—*L. H. C.*

A:—Complete information about the resilvering of mirrors will be found in the following books:

Scientific American Cyclopedia of Formulas, Munn & Co., N. Y.; *1995 Paint Questions Answered*, The Painters Magazine, N. Y.; *Problems of the Finishing Room*, by Walter K. Schmidt, The Periodical Publishing Co., Grand Rapids, Mich.

Shop Mathematics.

108. Q:—I desire a text to use as shop mathematics. It will be used in connection with a prevocational carpentry course. What can you suggest?—*H. G. L.*

A:—*Vocational Mathematics*, Dooley, $1, D. C. Heath & Co., Boston, Mass.; *Arithmetic for Carpenters and Builders*, Dale, $1.25, John Wiley & Sons, New York; *Elements of Applied Mathematics*, H. E. Cobb, $1, Ginn & Co., Boston, Mass.; *Mathematics for the Practical Man*, G. Howe, $1.25, D. Van Nostrand & Co., New York; *Practical Mathematics*, C. I. Palmer, $0.75, McGraw-Hill Book Co., New York.

Boat Building.

109. Q:—Some of the boys in my manual training class would like to build a small motor boat this year and have asked me for some plans. The boat should be large enough to carry four passengers. Do you know where I could obtain plans and other information about boat building?—*O. E. H.*

A:—*Nine Motor Boats and How to Build Them*, $1, Munn & Co., New York; *Hand-V Bottom Motor Boat Designs*, W. H. Hand, New Bedford, Mass.; *Model Power Boats*, E. W. Hobbs, $2, Spon & Chamberlain, New York; *Motor Boats*, W. F. Durand, $1.50, Munn & Co., New York; *Book of the Motor Boat*, A. H. Verrill, $1, D. Appleton Co., New York, Chicago; *Motor Boats and Hydroplanes*, T. H. Russell, $1.50, C. C. Thompson, Chicago; *Gas Engines and Launches*, F. K. Grain, $1.25, Munn & Co., New York.

Poems and Pictures Wanted.

112. Q:—I am anxious to locate a short verse or poem and a reproduction of a painting, or a work of art, on each of the following topics: Glass or Glass Making, Portland Cement, Concrete or Concrete Construction, Soap or Soap Making.—*Leon L. Winslow.*

A:—The editors of the magazine will be glad to forward suggestions from readers to Mr. Winslow.

Shoe Cobbling Text.

114. Q:—I should like to know if there is a text on shoe work which will show the steps taken in the work.—*P. H. L.*

A:—*West's How to Repair Shoes*, $0.50, Tuskegee Institute, Tuskegee, Ala.; *Dooley's Manual of Shoe Making*, $1.50, Little, Brown & Co., Boston; *Hasluck's Boot Making and Mending*, Cassell & Co., New York City.

Also, consult the Industrial-Arts Magazine File for 1916 (June issue, p. 260).

Pattern Making Textbooks.

115. Q:—I desire a textbook suitable for the teaching of vocational school pattern making. Can you recommend such a text?—*L. S. M.*

A:—*Purfield's Wood Pattern Making*, $1.88, Manual Arts Press; *McKim's Art of Pattern Making*, $2.50, Manual Arts Press; *Crawshaw's Problems in Pattern Making*, $1, Manual Arts Press; *Willard's Pattern Making*, $1, Manual Arts Press; *Horner's Principles of Pattern Making*, $3, D. Van Nostrand, New York City; *Chase's Art of Pattern Making*, $2.50, John Wiley, New York; *Turner & Town's Wood Pattern Making*, $1, Manual Arts Press; *Barrows' Practical Pattern Making*, $2, N. W. Henley Co., New York; *Wilson's High School Course in Wood Pattern Making*, $0.80, M. E. Smith, Washington, D. C.; *Green's Pattern Making Notebook*, $0.32, Manual Arts Press; *McCracken & Sampson's Course in Pattern Making*, D. Van Nostrand, New York City.

Making a Wireless Set.

116. Q:—Can you supply me with complete information for the building of a wireless set, i. e., instructions suitable for Junior High School work.—*H. G. L.*

A:—Complete information about building wireless outfits will be found in the following books:

How to Build Wireless Receiving Apparatus, $0.35, Experimenter Co.; *How to Make Wireless Sending Apparatus*, $0.35, Experimenter Co.; *St. John's How Two Boys Made Their Own Electrical Apparatus*, $1, T. M. St. John, New York City; *St. John's Wireless Telegraphy*, $1, St. John; *Collins' Plans and Specifications for Wireless Telegraph Sets*, $0.25, Spon & Chamberlain, New York City; *Harrison's Making Wireless Outfits*, Spon & Chamberlain, New York City.

Gilt on Furniture.

117. Q:—I am writing to ask you for the materials and methods used in putting gilt or gold paint on furniture or lamps so that it can be burnished giving as a result an imitation of gold leaf. I have used ordinary gilt on wood when using polychrome finish, but I cannot burnish the gilt and it tarnishes or turns dark in a very short time.—*R. O. C.*

A:—I regret to say that there are no materials or methods whereby gilt or gold paint can be successfully applied in imitation of burnished gold. This practice calls for the application of pure gold leaf and requires the utmost of technical skill coupled up with continued long practice. For the novice to attempt the application of gold leaf on embossed or carved work would be similar to an attempt to paint a sunset. However since most men of any ambition or initiative are willing to try anything once, I will offer the following suggestions.

First have all carved work sanded absolutely smooth and clean, after which apply a coat of varnish well brushed out. Let dry until thoroly hardened; then fill all pores with a silex filler, tinted with pure French ochre, golden shade. Let dry 48 hours, sand all work with a split 0000 paper, dust off and brush on a full-bodied coat of varnish, like Keystone DeGrah, which dries to rubbing consistency in 24 hours in a warm well-ventilated room. Sand this surface lightly when dry, dust off and then apply a coat of Gilder's Gold Size which may be either a fish or parchment size, the latter being more preferable. Let this first coat dry and when hard brush on a second, using an inch or inch and a half camel's hair brush which has been well washed free of dust and loose hair. When this coat is tacky to the touch, it is ready for the gold leaf. To prevent the gold leaf from adhering to undesirable portions these should be lightly coated with a thin solution of boiled laundry starch, which when dry, will enable the extra leaf to be removed by a little warm water and cloth.

To prepare the gold leaf open the book with the left hand, lay it on any convenient surface and with a spatula or other dull knife with a smooth edge, free from knicks, cut the gold leaf to a shape approximating the surface to be covered. This need not be very accurate as the laps do not show on this class of work. With a piece of thin waxed sandwich paper, about three inches square, pick up the cut gold leaf from the pad and transfer it to the still sticky or tacky sized surface. Do not use more size than about three square inches ahead of the work. With a piece of cotton or a round half inch camel's hair brush,

lightly pounce the gold leaf into place being careful to use a light stroke at right angles to the work and to avoid any sliding motion which would tend to split the leaf. Continue this method until the entire surface is covered as planned. Let the work dry at least eight hours before attempting to burnish which may be done with the usual agate burnisher or the highly polished bone handle from an old toothbrush. Work the burnisher with a light rotary stroke and avoid polishing any surfaces which do not correspond to the natural position of high lights. In case colored effects are desired, use very thin solutions of colored bronzes in banana oil. All portions not burnished should be brushed over with a thin solution of laundry starch that has been boiled, in order to flatten off and keep the work clean. The burnished portions may be protected with a coat of banana oil free from lacquer.—*Ralph G. Waring.*

Blueprints.

119. Q:—Can you tell me where I can get blueprints for problems of 7th and 8th grades? If you can, give me the names of two blueprinting companies.—*W. O. H.*

A:—Blueprints can be purchased from the Schenke Blueprint Company, 1632 Merryman St., Marinette, Wis. You can obtain tracings of problems in printed form from the Manual Arts Press, Peoria, Ill. Ask for Siepert's Problems.

Handcraft Problem Sheets.

Series I, 10 sheets, Manual 7x7 inches. Published by Frank I. Solar, Handcraft Syndicate, Detroit, Michigan.

This set of handcraft problems includes ten sheets, each containing a working drawing and a brief set of instructions for making a simple article which is within the abilities of the average seventh or eighth grade boy. Set I, which is at hand, includes a Christmas Tree Stand, Fly Trap, Leg Rest, Lamp, Telephone Screen, Plant Box, Dog Toy, Baby Toy Car, Dancer Toy, and Submarine Toy.

PUBLICATIONS.

Motion Picture Films of Educational Value in the Possession of Associations and Commercial and Manufacturing Companies. Extension Leaflet No. 2, December, 1919. U. S. Bureau of Education, Department of the Interior. The present pamphlet which has been prepared by Dr. F. W. Reynolds, of the extension division of the University of Utah, offers an extensive list of such industrial and commercial companies as have in their possession valuable motion-picture films which they are willing to loan to schools, colleges, universities and other organizations for temporary use. In borrowing the films, it is expected that the transportation charges will be paid both ways, and that the material be returned in good condition.

Annual Report on Vocational Education and Manual Training for New Jersey. By W. A. O'Leary. This valuable document covers the work of the New Jersey schools for the year 1918-19. It is a type of document which should be issued by every state.

NEW CHIEF OF INDUSTRIAL REHABILITATION.

The Federal Board of Vocational Education has appointed Mr. Lewis H. Carris as Assistant Director for Industrial Rehabilitation. Previous to entering the Federal Board in 1917, Mr. Carris was assistant commissioner of education for New Jersey in charge of vocational education.

The work of the vocational rehabilitation of persons disabled in industry is to be carried out by the state boards for vocational education. Under the law passed in June, 1920, an appropriation of $750,000 is made for the year 1921 and $1,000,000 for the three following years, to be divided among the states according to population. Each state must match the federal appropriation with an equal amount of money.

VOCATIONAL EDUCATION IN ILLINOIS.

The Illinois State Department of Public Instruction has issued a tabulation of the cost and enrollment of vocational classes under the Illinois State Board for Vocational Education. The report shows that 26 cities offered, during the school year 1919-20, industrial courses, employing 208 teachers with an enrollment of 12,899 pupils. The state granted these schools a total subsidy of $74,054. The city of Chicago received of this total sum nearly $61,500. The city enrolled 10,473 pupils under 126 teachers.

Twenty-three cities in the state conducted during the year evening trade extension classes. Of these, Chicago conducted eight schools with an enrollment of 2,732 pupils under 62 teachers. The total enrollment for the state was 4,222 and the total state subsidy was $11,970.

Part-time general continuation schools were conducted in five cities with an enrollment of 7,886 pupils. Part-time trade extension schools were conducted in Chicago, Moline and Rockford, and enrolled 705 students. Full-time trade schools were conducted in Chicago and Rockford only with a total enrollment of 88 students. Teacher training was conducted by the University of Illinois and 285 students were enrolled.

The vocational agricultural courses were conducted in 77 schools and offered courses from two to four years in length.

VOCATIONAL RECORD OF THE MARSHALLTOWN HIGH SCHOOL.

Supt. Aaron Palmer of Marshalltown, Ia., believes in facts as the basis for studying educational results. Thus to determine the value of high school instruction in Marshalltown, he has compiled yearly a detailed statement of the occupation of the alumni of the school. This record now includes the vocational facts of every graduate beginning with the class of 1907. Altogether the records of 826 young men and women have been compiled and checked up to September 1, 1920.

Of the total number, 200 are now classified as college students so that it is not practical to tabulate the number of students as to their present vocations without some inconsistencies. However, it may be said that more than 60 per cent of the 826 members of the alumni have continued their education in higher institutions of learning, so that the school has rightly had a very distinct duty as a college preparatory school.

Mr. Palmer has summarized the entire findings as based on his latest check-up as follows:

1. A small per cent of the graduates is engaged in industrial occupations, aside from agricultural, except in a managerial capacity.

2. The professions and clerical work have a very strong claim on the men graduates.

3. The women who attend college, with a very limited number of exceptions, enter teaching as a profession.

4. A very large proportion of the women who do not attend college enter clerical employment, immediately upon graduation.

5. A large number of permanent business places in Marshalltown have high school graduates on their office force.

6. The home seems to be the ultimate destination of most of the women. The time spent by girls in professional and clerical work is on an average less than three years following the completion of their special preparation of service.

7. Marshalltown offers good opportunities for her own sons and daughters for entrance into professional, technical or industrial pursuits.

8. The experience of Marshalltown is that high school education affords 87 times the opportunity to render distinguished service that one has without it, and with a college education 800 times the opportunity.

ANNOUNCE ART AND INDUSTRIAL CONFERENCES FOR NEW YORK STATE.

The Division of Agricultural and Industrial Education of the New York State Education Department has announced a number of meetings for teachers and supervisors of art and industrial art to be held during the year. The conferences are so distributed as to practically cover the state and provide an opportunity for informal discussion of the subject matter, drawing and construction involved in these subjects. The schedule is as follows:

Albany, Oct. 22; Buffalo, Apr. 22, 1921; Fredonia, Oct. 29; Hudson Falls, Feb. 4, 1921; Newburgh, Nov. 19; New York, May 20, 1921; Oneonta, Nov. 17; Rochester, May 6, 1921; Rochester (state teachers' convention), Nov. 24; Syracuse, Feb. 11, 1921; Utica, Feb. 18, 1921; Watertown, Apr. 8, 1921; Watkins, November 5.

The exhibits will be in the hands of a special committee living in or near the place of the conference. Local exhibits will be supplemented by state exhibits and by special exhibits made up by the teacher training institutions.

It is planned that conferences dealing with other subjects, which may include some drawing, shall be held during the year under the direction of the various specialists.